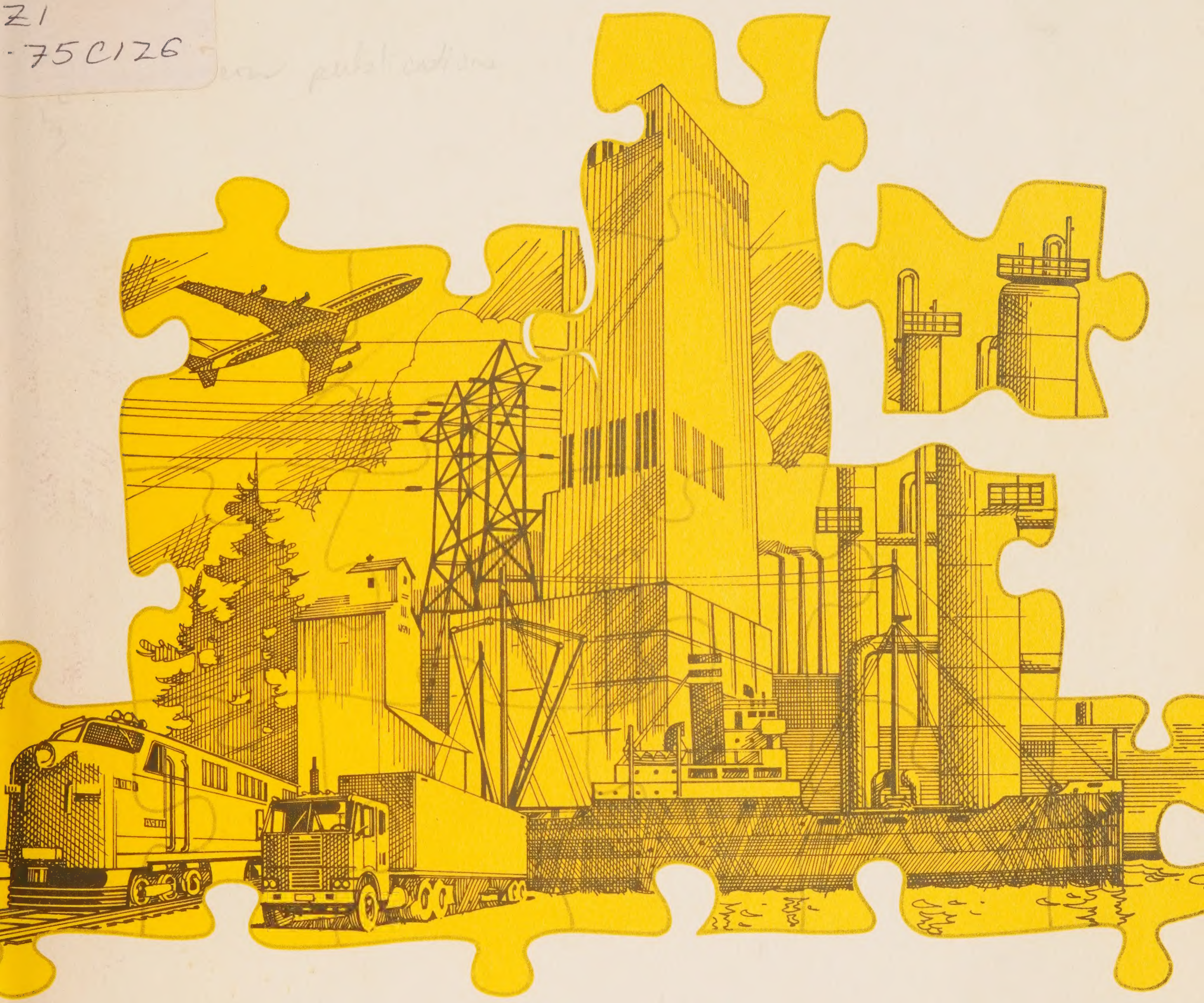
Royal Commission on Corporate Concentration



STUDY NO. 26

Studies in Canadian Industrial Organization

A Technical Report

Royal Commission on Corporate Concentration

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Studies in Canadian Industrial Organization

by

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FOREWORD

In April 1975, the Royal Commission on Corporate Concentration was appointed to "inquire into, report upon, and make recommendations concerning:

(a) the nature and role of major concentrations of corporate power in Canada;

(b) the economic and social implications for the public interest of such concentrations; and

(c) whether safeguards exist or may be required to protect the public interest in the presence of such concentrations".

To gather informed opinion, the Commission invited briefs from interested persons and organizations and held hearings across Canada beginning in November 1975. In addition, the Commission organized a number of research projects relevant to its inquiry.

This series of studies in Canadian industrial organization were prepared under the aegis of Professor Richard E. Caves of Harvard University. The studies themselves are diverse in content, but share a common origin in an integrated data set which contains a large number of variables on the Canadian manufacturing and distribution sectors. The authors test individual hypotheses with consideration to their interrelated and simultaneous character.

Professor Caves is the author of several books and monographs, and a number of articles on Canadian industrial structure and performance. He is Professor of Economics and former chairman of the economics department at Harvard University. His colleagues in this study are Michael E. Porter, Associate Professor of Business Administration at Harvard Business School; A. Michael Spence, Associate Professor of Economics at Harvard University; John T. Scott, Assistant Professor of Economics, Dartmouth College; and André Lemelin, Ph.D candidate in the Department of Economics, Harvard University.

The Commission is publishing this and other background studies in the public interest. We emphasize, however, that the analyses presented and conclusions reached are those of the author, and do not necessarily reflect the views of the Commission or its staff.

Donald N. Thompson
Director of Research

ACKNOWLEDGMENTS

The main data base underlying this project was prepared in late 1975 and early 1976, and the statistical analysis reported here was carried out during the late spring and summer of 1976. The data base bas been extended since that time, and research is continuing on the subjects reported here as well as on hypotheses that could not be tested prior to the deadline for submitting our report. We hope to complete arrangements for making the data base available to others doing research on Canada's industrial structure and performance.

Preparation of the main data base was supervised by R.E. Caves and J.T. Scott. We are grateful to Bronwyn H. Hall for programming assistance in extracting information from machine-readable sources, organizing the data base, and assisting us in making efficient use of it. Additional programming services on the Dun & Bradstreet data were provided by Mary Hyde. James C.T. Linfield undertook much of the work of calculating and transcribing data from published sources. Thomas A. Barthold and Kurt D. Brown executed most of the computer-based calculations. Exploratory computations were also made by Ronald Saunders. Donald N. Thompson, Director of Research for the Royal Commission, helped us in many ways to secure data, and we are also grateful for assistance from members of the Institute of Policy Analysis, University of Toronto (especially Leonard Waverman and Stephen D. Berkowitz).

As the project developed, we were aided by comments from various sources. These include seminar audiences at Harvard University, M.I.T., Duke University, the University of Toronto, and University of Western Ontario. Among our Harvard colleagues, Martin Feldstein and Zvi Griliches deserve special mention. Helpful comments were also received from two referees secured by the Royal Commission.

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INTRODUCTION AND SUMMARY

This report is a study of industrial organization in Canada. It focuses on the large company in Canadian manufacturing and retailing, and on the industries in which it is embedded. The central features of the large firm's behavior and their consequences for society are numerous, and reflect the firm's nature both as a bureaucratic organization and as a participant in and link between the markets that comprise the industrial sector of the economy. The large firm often competes with a limited number of rivals, and its behavior determines the extent and character of competition in its principal markets; it deals in the markets for debt and equity capital, and its fortunes are affected by the terms it can secure; by means of its advertising outlays it participates in the market for product information; and finally its diversification permits the large firm to seek goals that are not tied to any one market.

One of the pervasive issues about the large firm is its very size, and we examine this issue in its several forms: What determines the size of the leading companies in manufacturing and retailing? Can we explain their patterns of diversification? How does the size of large companies relate to the concentration of leading sellers that we observe in individual industries? Another group of vital questions circles around the influence of the large firm on the markets in which it competes, and can be answered only by careful study of the markets themselves. What determines the level and composition of advertising outlays in product markets? Does the large firm enjoy advantages in the market for capital funds? What relation exists between company size and efficiency, and how are these jointly affected by the size of the economy and its exposure to international trade? Our report employs statistical methods to attempt answers to a selected but broad range of these questions.

The studies presented in this report share two unifying elements, both of which distinguish their approach from that traditionally taken in statistical research on industrial organization. First, they both employ an integrated data base that contains a large number of variables observed on industries and major companies in the Canadian manufacturing sector. Second, they test individual hypotheses with heed to their interrelated and simultaneous character.

In this chapter we shall describe our working methods and then present a non-technical summary and interpretation of our results.

RESEARCH METHODS AND PRESENTATION

In the last two decades statistical methods have become the dominant tool for empirical research in the field of industrial organization. Are large companies more diversified than small ones? Do they attract funds more cheaply on the capital markets? These and myriad other questions yield themselves to statistical tests that are procedurally straightforward if appropriate data can be secured. To investigate the hypothesis about

diversification, for example, one gathers a sample of companies and devises a method for measuring the diversity of their activities. One measures their size, and also measures other traits of the companies and their environments that, according to economic theory, might influence their diversity. The statistical methods then are applied to tell us whether size and diversity are associated with each other more closely than could occur at random except on a very small chance.

Our research has consisted mainly of the statistical testing of a large number of hypotheses about industrial and business organization in Canada. Our principal data base consists of observations on many variables for 123 industries and an independent population of 125 large manufacturing companies. For each company we identified both its primary activity and also the whole array of manufacturing industries in which it operates. We could therefore relate a company's characteristics both to the structure of its primary industry and to weighted-average observations of all the industries in which it operates. The contents of the main data base are described fully in Appendix A, and so the definitions of variables are given only briefly when they are used in the report. Some chapters that use data developed independently of the main data base describe their own sources.

The more important of the two unities in our research approach lies in the attention given to the interrelations among the hypotheses tested. We operate in the eclectic tradition of research in industrial organization that organizes its hypotheses under the broad concepts of market structure, conduct, and performance. 'Structure' refers to the environmental forces determining the behavioral options open to competing sellers in a market; 'conduct' refers to the patterns of market behavior they adopt, and 'performance' to the normative appraisal of how effectively society's resources are used as a result of their behavior. The economic theory underlying this framework of concepts implies that the features of the industrial system we observe are related in causal hierarchies--with prime movers that determine derived aspects of market structure, which in turn determine patterns of behavior, and thereby set market performance. Another implication is that, at any one level of this hierarchy, various elements are determined simultaneously and not independent of one another. Our research design tried to take account of these points.

The distinction between "prime movers" and other variables holds particular importance for studying industrial organization in Canada. Statistical studies of industrial organization in the United States can assume, as a first approximation that the size of the market extends to the nation's boundaries and no further. They neglect the relationships, both technological and economic, between a given industry in the United States and its counterpart in other countries. That posture is clearly not valid for Canada. Companies in some industries operate in markets that stretch beyond Canada's borders. They find themselves in close competition with foreign enterprises, either as sellers of competing imports or as rivals for Canadian exporters. And companies in industries that are relatively close to foreign competition (through transportation costs, tariffs, or other legal restrictions) operate in a small national market, and that smallness affects such features as the scale of production, the number of

rivals, and the number of product varieties produced. The size of Canadian markets and their exposure to trade therefore exert a pervasive influence on the elements of market structure--number and size distribution of sellers, absolute size of companies, ease of entry for new competitors, extent and character of product differentiation, etc.--that are usually regarded as prime movers in studies of industrial organization.

We deal with this problem of research in several ways. Chief among them is the employment of an international comparative approach, usually using the United States as a country with generally similar technology, tastes, and institutional environment but differing greatly in the size of the national market. In Chapters 2, 3, 7, and 11 we utilize the characteristics of matched United States industries as normalizers, or controls, in order to bring out the effects of Canadian conditions on such important features of the industrial scene as advertising, seller concentration, and productivity.

The studies contained in this report of course deal with only selected aspects of the structure and performance of Canada's industries and large companies. Nonetheless, they touch on a number of major aspects of the structure of industries and some facets of their performance. The report is organized in a way suggested by the methodological apprach just set forth. It starts by comparing certain traits of Canadian market structures with their United States counterparts and drawing conclusions from the differences that are exposed. Chapter 2 deals with the retailing sector, Chapter 3 with the structure of advertising and other information provided by the seller, and other chapters (particularly 11) also employ this comparative mode. In Chapters 4, 5, and 6 we then consider the diversification of companies and industries, its causes and some of its effects. Chapters 7 and 8 deal with industrial concentration--the concentration of sellers in manufacturing industries in Chapter 7, the concentration of large companies in the manufacturing sector overall in Chapter 8. Chapters 9 and 10 consider capital markets and their influence on industrial organization, concentrating on how the cost of capital to manufacturing companies is affected by their size, output diversity, and market power. Finally, Chapter 11 considers broadly the way in which the fundamental forces governing the organization of industries (technology and tastes) interact with the special features of the Canadian economy (its small size and the high but variable exposure of its industries to international competition) to affect the standard elements of market structure and thereby the relative efficiency levels achieved by Canadian manufacturing industries.

SUMMARY

Because the coverage of our report is broad and the conclusions of our analyses substantially interrelated, we provide here a summary that emphasizes these interrelations. It is nontechnical, and therefore indicates only in a rough way what research methods we used and what degree of confidence we believe can be placed in our various conclusions.

COMPARATIVE FEATURES OF INDUSTRIAL ORGANIZATION

Our analysis yielded a number of comparisons between the characteristics of matched Canadian and United States industries. These comparisons are interesting in themselves, and so we present them somewhat independently of the conclusions that can be drawn from them (the evidence is presented in Chapter 11, unless otherwise noted). Canadian and American manufacturing industries are clearly different in ways that can affect the Canadian economy's performance. The mean values of various measures of efficiency and cost are, with few exceptions, very different from one another although they are constructed so that the differences in market size do not enter directly. Value added per worker in 1967 was less than four-fifths of the comparable figures for the United States.

Canadian industries are with very few exceptions more concentrated than their U.S. counterparts--a natural consequence of a smaller market, increasing returns to scale, and the greater exposure to foreign competition. The average-size manufacturing establishment in Canada (measured by value added) does not appear to differ greatly from that in its U.S. counterpart industry. This suggests that the main difference between the Canadian and U.S. industries lies in the number of plants and companies, not in the size of the plants. (To the extent that these fewer plants serve customers dispersed over a large geographic area, our finding confirms the traditional suspicion that Canada suffers from a high burden of transportation costs.)

Although plant and company sizes are similar in the overall smaller Canadian economy, it does not follow in a simple way that the concentration of large companies in Canada is greater. True, company concentration in Canadian manufacturing is higher in the sense that the largest 100 companies account for 45% of value added by manufacture, whereas the largest 100 in the United States account for only 33 per cent (see Chapter 8). But the largest 100 in Canada are a much smaller proportion of all companies, and so relative top-end concentration is lower. The extent of multiplant development in matched Canadian and U.S. industries is remarkably similar--number of plants per company, proportion of companies operating in multiple industries--and the big difference comes simply in the number of companies. The only difference in the pattern of multiplant development is that U.S. companies have proportionally more plants classified to sectors other than the base industry--one piece of evidence that they are more diversified.

The Canadian and American retailing sectors are quite similar in their structure, both in their arrays of classes of retail firms and the extent to which chain stores prevail in the individual classes (see Chapter 2). However, the chain stores hold somewhat lower market shares in Canada, especially in the retail outlet classes for which convenience is a key aspect of consumer buyer behavior, such as food stores and drug stores. Associated with lesser chain-store penetration, we find that individual retail establishments are generally smaller than in the United States. But while chains possess smaller shares in most classes of Canadian retailers, the concentration of retail sales in the very largest retail chains is greater than in the United States. This finding is parallel to the one reported above for large manufacturing companies.

The advertising outlays of Canadian industries, expressed as a fraction of their sales, are also quite similar in level to their U.S. counterpart industries (see Chapter 3). That finding is expected, because advertising levels generally depend on the pattern of information sources used by the buyers of a product, and this evidently does not vary much from country to country. The mean rate of advertising in Canadian industries, however, is lower than in their U.S. counterparts as is advertising as a fraction of gross national product. Canadian advertisers make greater use of local media (newspapers, radio, and local television) and less of national television and magazines.

Nonproduction workers account for larger fractions of employment in most Canadian industries than in their U.S. counterparts, despite lower levels of such nonproduction activities as research and development. Salaries of Canadian nonproduction workers and production-worker wages were below the American figures in 1967. The higher proportion of nonproduction workers suggests that their numbers may be an important aspect of overhead costs, and a testimony to the increasing returns to scale in many industries.

We compared our matched industries on a number of measures of efficiency. A familiar if deceptive one, value added per worker, in 1967 was on average 80 per cent of the comparable figure for the United States. Canadian industries with relatively high value added are highly concentrated, usually highly capital-intensive, and likely to have high price-cost margins. Price-cost margins, though, are usually below the U.S. figure, partly because of lower average capital-intensity and therefore a lower share of capital, but also partly because international competition places a ceiling on industries' prices. The most striking evidence that the manufacturing sectors are different in their performance is that using a set of ten indexes of performance (defined so as not to reflect differences in scale), one can determine (without knowledge of what product it makes) whether an industry is Canadian or American with no more than a 4.2 per cent chance of error. This is true despite the large differences in these performance indexes among industries within each country.

STRUCTURAL FEATURES OF CANADIAN MARKETS

We now consider the causal factors that were found to be at work behind the conspicuous structural features of Canadian manufacturing industries. After summarizing our results on these individual features, we shall draw together the evidence on key explanatory forces that affect them all.

Seller concentration, manufacturing industries (Chapters 7, 11). Concentration in manufacturing industries is highly correlated with concentration in their U.S. counterparts, but concentration in Canada is subject to many significant determinants besides the general forces that influence industries' concentration in the United States (and other countries). Industries that are relatively capital-intensive under production conditions in Canada tend to be more concentrated. Economies of scale influence concentration by enlarging the minimum efficient size of industrial plants and

inflicting cost penalties on units of smaller scale, thus reducing the number of plants. We found that concentration is related positively to the size of this minimum efficient scale (measured relative to the size of the market), in industries where the cost penalty for smaller units is heavy. The effects of advertising and product differentiation on concentration are various and complex. Advertising levels by themselves are not related to concentration in the broad spectrum of manufacturing industries, but there is evidence that they make concentration of the top few firms somewhat independent of the influence of minimum efficient scale just mentioned--a result consistent with the finding of other investigators that heavy rates of national media advertising by some industries build a barrier to the entry of new competitors. Consistent with this, we found concentration higher in the "convenience goods" industries in which advertising is likely to create entry barriers around the leading firms' positions. On the other hand, advertising and product differentiation also increase the viability of small companies, and that is a downward pull on concentration independent of the upward pull created by the protection that heavy advertising gives to the market position of dominant firms.

Because small size is a notable feature of the Canadian economy, we gave attention to the degree to which market size influences concentration, and the channels through which it operates. The Canadian national market is the relevant one only in certain industries. We found that concentration in export industries is unaffected by the size of the Canadian market; in industries more sheltered from trade, however, concentration is definitely affected by national market size. It also turns out that the absolute size of establishments is larger in the export-oriented industries. Exposure to trade on the import side does not have the same effect on the concentration-size relation, probably because Canada's import-competing industries are much more subject to product differentiation than her export industries. In industries sheltered from imports a reduced market size cuts the number of companies, but it also cuts the extent of multiplant operation by the leading firms, leaving the concentration of the leading sellers on balance unrelated to market size.

Diversification (Chapters 4-6). We constructed indexes of the diversification of outputs for a large number of Canadian companies and examined the determinants of diversification both in the individual companies and in the base industries to which they are classified. The diversity of the outputs of Canadian companies increases with their size, but at a decreasing rate. Even with size (measured by employment) controlled, diversity increases with the number of plants operated by a company, suggesting that companies find it profitable to incur the overhead of additional plants rather than to aggregate many production lines in a single plant and location. We found weak evidence that subsidiaries of multinational companies are more diversified than Canadian-owned companies of similar size--an expected outcome because a subsidiary typically can add an output line already produced abroad by its parent at a lower cost than can an independent company. We also found that differences in the output diversity of companies can be explained partly by differences in the structures of their industries. Product differentiation (measured by advertising rates in the company's home industry) is hostile

to diversification, and a conjunction of high exports and high concentration in the base industry is also negatively related to diversification. A postive relation was expected between diversification and concentration in the base industry, but the evidence for our sample of large companies leans against the hypothesis. One evident competitive consideration, though, is that the more that large companies are diversified, the more other companies have diversified into their base industries. This pattern might simply mean that the base industry's output is congenial to joint production with outputs classified to certain other industries, so that comapnies would diversify in either direction in order to enjoy these advantages. Or the pattern might indicate that competitors who have diversified into the base industry pose a risk that the specialist firm can better meet if it also resorts to diversification.

We found that large companies diversify into industries with smaller establishments and lower seller concentration than their base industries. This conclusion sets a limited value on the going firm as an entrant to industries surrounded by high entry barriers. As expected, companies tend to diversify into industries that are growing faster than their own base industry and that are exporting a smaller share of output than their base industry (a fact suggesting that companies view export markets as especially risky and diversify to reduce this risk). We also found that the more diversified companies are the ones with older and slower-growing capital stocks.

Differences in the extent and pattern of companies' diversification have been summarized by students of business organization in a classification of companies by their corporate strategies. We found systematic differences among the large Canadian companies classified as employing single-product, dominant-product, and related-product strategies. These differences stem from the characteristics of the companies themselves but even more from the characteristics of their base industries, and it seems possible that their strategic choices are largely determined by the structures of their base industries and by their respective degrees of success or failure in those industries.

We sought to explain the variation in the diversification patterns of industries, measured by weighted averages of the diversity indexes of companies classified to them. It proved relatively easy to explain the extent of diversification into an industry by companies based in other industries. Inbound diversification amounts to entry by established companies, and the factors that should explain going-firm entry explain inbound diversification quite well. It is low in highly concentrated industries, where entry barriers are probably high enough to repel all entrants, and also low in very unconcentrated industries where the going firm sees no hope of earning more than a competitive profit. Companies avoid diversifying into industries with heavy initial capital costs or strong import competition.

We were much less successful in explaining the amount of diversification out of an industry than the amount into it. Apart from confirming some of the factors mentioned above as explaining the diversification of large companies, our only additional substantive result (a weak one) was that industries selling in regional markets do relatively little diversifying.

There is probably a good reason why it is harder to explain the diversification of all companies classified to an industry than that of the leading companies alone. The leaders' diversification depends on competitive conditions that economic theory is adept at analyzing, whereas diversification by "follower" firms who behave largely as pure competitors may depend mainly on technical complementarities that economic analysis is not equipped to handle.

Size of large companies (Chapter 8). We examined the differences in the size (total assets) of the large companies in our sample in relation to the markets in which they operate. A company could be large because it operates in large markets, holds a large share of sales in the markets in which it operates, and/or operates in a large number of markets. Both seller concentration and average company size in a firm's base industry make substantial contributions to explaining its size; the proportion of its activity outside its base industry contributes rather less. When we examine averages for all industries in which the company operates, the average concentration level looks somewhat less important (because companies typically diversify into industries less concentrated than their base industry) and their level of diversity (now measured by the total number of activities in which they engage) appears more important. The average capital intensity of their industries is important for explaining differences in the total assets of large companies.

Structure of retailing (Chapter 2). We examined the structure of the retailing sector, both because its efficiency is important for the economy's performance, and because its bargaining power affects the market power of makers of consumer goods. Many of our analytical conclusions are drawn from comparisons with the U.S. retailing sector. The chain stores' smaller share of Canadian retailing is seen to flow from differences in the underlying causes of chain stores in the two countries. The logistical efficiencies of chain stores are less pronounced in Canada due to the geographically dispersed distribution of population and smaller size of the national market. The cultural and economic diversity of Canada's consumers are reflected in diverse tastes that tend to offset the economies of centralization and standardization that are central to chain-store efficiency. The slightly lower income levels, education levels, female workforce participation and consumer mobility in Canada all increase the propensity of buyers to devote time to shopping, and to shop locally. The "convenience" motive for buying that fosters chains of broad-line retail outlets is attenuated. Canada has greater chain penetration in a small group of retail outlets not in the "convenience" class, and which are in areas of distribution where differences in consumption patterns yield larger relative product volumes or broader product lines than in comparable U.S. outlets. These same factors exert a downward influence on the size of individual retail establishments. The greater diversity of buyers appears to promote a variety of more specialized establishments in many classes of retail outlets instead of a group of homogeneous establishments. The cultural and economic forces reducing establishment size are closely associated with those attenuating the development of chains. This effect is particularly evident in grocery stores and drug stores, where the chain's advantage is greatest in broad-line convenience outlets that provide minimum personal service to the customer and in large-scale chain organization that requires high population densities.

Despite these discouragements to chain-store development, we found that the concentration of retail sales in the largest chains is greater in Canada than in the United States. This concentration results from the economy's small size coupled with the efficiencies of operating large-scale chains, at least in the grocery and general merchandise fields. The combination of a small national market and impediments to chain development generally leads to a three-level retail structure. It contains (1) a few very large chains that have reaped chain-store economies and perhaps pre-empted the best retailing locations and attracted the convenience-conscious customers; (2) a larger number of small and medium sized chains, most operating in a single province or area, with their growth constrained by cultural diversity and other impediments listed above; and (3) many small, independent retailers offering service to the customer and product lines attuned to buyers in their areas. The stores of the large chains approach the sales productivities of similar establishments in the United States, but the establishments of the other retailers are smaller than their U.S. counterparts, often considerably smaller.

Level and pattern of advertising (Chapter 3). We included an investigation of advertising because of its importance as a component of the information sources that guide buyers' choices among brands, and because previous research has marked it as a key component of entry barriers and market power in consumer-goods industries. Companies advertise primarily because consumers are responsive to the information conveyed by advertising (relative to other sources of information on products such as that secured from shopping and physical comparison of goods, retail salesmen, and so forth). An industry's level of advertising is also affected by the relative cost of supplying messages to potential customers through advertising and other methods, and by the degree and character of competitive rivalry both within the manufacturing sector and in the retail stage.

The lower overall level of advertising in Canada as compared with the United States, mentioned above, can be explained by differences in buyers' behavior, the cost of supplying advertising messages, and levels of market rivalry in the two countries. Lower levels of income per capita, female workforce participation, and other differences increase the tendency to shop around and use retail salesmen as sources of information, and thereby decrease reliance on advertising. Diversity of tastes and the geographic dispersion of the population adversely affect the cost of advertising relative to other sources of product information. Thus, some of the same factors that limit chain-store penetration also reduce advertising in Canada relative to the United States. However, the chain stores' smaller share in Canada has its independent effect, reducing the manufacturer's incentive to advertise directly to consumers in order to overcome the bargaining power of mass distributors.

Differences in advertising rates among broad sectors of Canadian manufacturing follow those in the United States and also confirm the predictions of a theoretical model of advertising as a component of market information. Mean advertising rates are by far the highest in convenience-good industries where the consumer's demand for advertised information is the greatest and average

seller concentration among manufacturers the highest. It is lowest in producer goods where its role in buyers' choices is minor. And it take an intermediate value in consumer goods outside the convenience category (nonconvenience goods) wherein the consumer combines advertised information with shopping and information gathered from other sources in order to make a selection.

We found that the variation between the advertising rates of matched Canadian and U.S. industries could be substantially explained by the industries' relative levels of seller concentration, foreign ownership, and exposure to international trade. High relative concentration in Canada always increases relative advertising rates, and generally so does tariff protection and the absence of import competition. The presence of substantial foreign ownership always increases relative advertising rates. High exports are generally associated with lower relative advertising, though the interpretation of this result is complex. And advertising rates are lower in Canadian industries, as the sizes of their leading firms come closer to the sizes of their U.S. counterparts.

Differences between Canadian and American advertising rates are greater in some parts of the manufacturing sector than others. In producer-goods industries the differences could be explained quite well by differing degrees of competition among domestic sellers and exposure to international competition. Advertising is a relatively unimportant element of marketing strategy for makers of producer goods, and we would therefore expect advertising differences between Canada and the United States to be less sensitive to fine differences in buyers' behavior and more sensitive to differences in competition that affect the diversion of producers' rivalry from price competition into nonprice competition. Conversely, we found that we could explain less of the transnational differences in advertising rates of convenience-good industries, although they remained sensitive to competition and exposure to foreign trade. Advertising is central to the marketing of convenience goods, and our relative inability to explain differences in advertising rates may reflect unmeasured differences in buyers' behavior between Canada and the United States. The role of advertising in nonconvenience goods is intermediate between the convenience- and producer-good sectors, and our ability to explain Canada-U.S. differences in advertising rates is intermediate as well. Industries selling through distributive sectors subject to higher chain-store penetration in Canada were among those for which our statistical model tends to predict advertising rates lower than those actually observed. This finding provides some support for our hypothesis that chain-store penetration exerts an independent effect on advertising behavior, and that some of the transnational differences in advertising stem from the differences in chain-store penetration.

Advertising differs between Canada and the United States by the composition of media used as well at its overall level. Our comparisons were based both on matched Canadian-U.S. industries and on large companies operating in both countries. Local media--newspapers, radio, and local TV--are used much more heavily in Canada, national media--magazines, network television--much less. These differences may reflect a lesser availability of national media in Canada, but we found them also associated with a number of other differences between the two countries. With Canada's greater diversity in tastes and and culture, the flexible messages of local media offer advantages over national media that

transmit the same message to all readers or viewers. The smaller population reduces the economies of national media, and a greater propensity of consumers to shop around favors the relatively factual messages of newspapers and radio relative to television, with its emphasis on images and intangible factors. Among industries, exposure to foreign trade tends to be associated with lower use of national media. But industries in which foreign subsidiaries control large shares of Canadian sales tend to be heavy users of television, particularly network television.

Cost of capital (Chapter 9). The supply price of capital is an important influence on a nation's industrial environment. If large companies, or companies enjoying market power, are favored in their access to funds, the organization of the industrial sector will be affected (whether the advantageous access to capital represents real social economies or mere bargaining power). We investigated whether rational risk-averse lenders could be expected to demand a lower price for funds from large diversified firms and firms with market power. We found theoretical support for both connections dependent only on the assumptions that lenders are risk-averse and face transaction costs in diversifying their portfolios (we did not investigate the possible consequences of imperfect competition among the financial intermediaries). Our empirical evidence indicates that market power seems to reduce the cost of equity capital (the effect is not too certain), but we could not detect any effect of concentration per se on the cost of debt capital. The cost of equity also may be lower for more diversified companies (after we take account of seller concentration in their various markets). And larger companies may enjoy a lower cost of debt capital (the evidence is weak), although they do not gain lower cost of debt from diversification by itself. We found some evidence (Chapter 7) of the effects of capital costs on seller concentration: concentration is higher in industries that are capital intensive and where the minimum viable market share of sellers seems to be high.

Foreign trade and investment (Chapter 11). Because exposure to international trade influences both the structure and performance of Canadian industries, we briefly examined the relation between exposure to trade and other elements of market structure. Industries facing extensive import competition also exhibit high shares of production controlled by foreign subsidiaries. Imports and subsidiary sales are both increased due to advantages enjoyed by companies outside Canada--intangible assets that expand their potential shares of the Canadian market, whether these shares are claimed through imports or subsidiary sales. Imports are also related to product differentiation, a fact revealed by the higher import shares in consumer-goods industries (especially convenience-good industries) and in industries with high advertising-to-sales ratios. High exports as a proportion of shipments are associated with large sizes of company and establishment, but the causation probably runs from exports to size rather than the other way.

SIZE, TRADE EXPOSURE, AND INDUSTRIAL ORGANIZATION

Many of the structural features of Canadian industries that we have reviewed are affected by two distinctive traits of the nation's economy--that it is strongly exposed to international trade, and it is smaller than many other industrialized nations. Here we draw together a number of findings (including some already mentioned) about the roles of trade-exposure and size.

Exposure to foreign trade. The central effect of foreign trade on industrial organization is to extend the market and lower the effective level of seller concentration in the domestic market. Tariffs of course mitigate this effect by reducing import competition in the tariff-protected markets and (through general-equilibrium adjustments in the economy) decreasing the extent to which other industries can compete on export markets. Here we draw together our evidence on the market-extending effects of international trade and the market-shrinking effects of tariffs.

Operation in a small market restricts the number of companies, if any scale economies are present. It also tends to restrict the size of companies, not only because they cannot exhaust economies of scale in production but also for reasons related to product differentiation and the character of competition in industries in which small numbers of sellers maintain collusive understandings with one another. Companies' sizes are clearly larger in Canada's export industries. We found that the concentration of sellers is unrelated to the size of the Canadian national market in industries with heavy exports but negatively related in low-export industries. This relation confirms that, for industries sheltered from trade, market size restricts the number of companies, whereas in export industries size must be determined mainly by scale economies. The same distinction is not apparent, however, between industries with and without exposure to import competition. In industries sheltered from imports, smaller size of the Canadian market decreases the number of sellers, but it also decreases the extent of multi-plant operation, with an offsetting effect on concentration. Tariff protection is negatively related to concentration because it makes room for more small-scale companies in Canada.

Foreign trade and investment have a consistent effect on advertising behavior in Canadian industries. Import competition reduces advertising rates while tariff protection increases them. Because advertising rates are inflated in concentrated industries where rivalry shifts to nonprice forms, this finding is consistent with our conclusion that international trade extends the effective size and competitiveness of the market. Industries with heavy foreign ownership advertise more than industries with few subsidiaries of foreign companies. High imports and exports both tend to be associated with decreased use of television advertising, while industries with heavy foreign ownership are heavy users of television advertising and especially network television. (In view of the consistently heavier advertising of foreign subsidiaries, our results yield little indication that the potential ability of subsidiaries to exploit spillovers of their parents' advertising in the United States reduces their advertising costs.)

These results point to a difference in the marketing approaches of foreign-owned and Canadian companies. Perhaps to capitalize on intangible assets in differentiating their products, foreign-owned firms seem to place greater stress on advertising, on common national products and advertising themes, and on the less tangible product traits best advertised on television. Canadian companies, on the other hand, appear to emphasize more diverse appeals and rely relatively more on local media and sales promotion through retail outlets. These results support the evidence from previous studies that foreign investment is motivated prominently by the desire of large and successful companies to maximize the profits earned on their intangible assets (including skills at differentiating products and promoting them to mass markets).

Size of national market. The effects of exposure to foreign trade (or protection from it) interact importantly with the small size of the Canadian national market, especially in the presence of any form of product differentiation (whether due to "brands" or simply to the intrinsic heterogeneity of an industry's product line). In such settings each producer faces increasing returns, and the small size of the Canadian market and tariff protection combine to have a number of important effects. Foreign competition tends to preclude Canadian production of the product varieties preferred by small minorities of customers and able to command only small market shares, and as a result these products are secured by import. Among such industries, imports' share of the market and the relative efficiency of Canadian producers should be positively correlated, because Canadian producers can more fully attain the available economies of scale the more they concentrate on broadly demanded varieties. This process is seen in the positive relation between seller concentration and a variable used in our analysis that measures the efficiency of small relative to large establishments within a given manufacturing industry (either in Canada or the United States). In the United States this measure is negatively correlated with seller concentration, logically reflecting a tendency for establishments (and companies) to be large and few in number in industries with substantial scale economies. But in Canada this measure (taken from data on Canadian manufacturing establishments) is positively correlated with seller concentration. That is, where small establishments are at a disadvantage in the much larger U.S. market, Canadian establishments are forced to be both few in number and relatively similar in cost and productivity. This process can only occur because of the combined effects of the smallness of the domestic economy and its openness to trade.

Other variables affected by market size include the diversity of companies' outputs. Canada's manufacturing establishments are not much smaller than their U.S. counterparts, but they are rather more diversified. Shrinking the size of a plant and packing more lines of output into it are alternative ways of dealing with the constraints of small market size. As their participation in export markets increases, the extent of companies' output diversity diminishes, especially in concentrated industries; this result suggests that removal of the market-size constraint somewhat reduces the incentive to diversify. On the other hand, when companies in exporting industries do diversify, they seek out sectors with fewer exports, presumably to avoid the

risks of the international market. On the import side we do not find this connection between trade-exposure and diversity, probably because of the technical properties of the industries involved.

The role of multinational companies can be briefly fitted into this pattern. The shares of the Canadian market held by imports and foreign subsidiary producers, we noted above, are positively correlated. Subsidiaries' shares are also positively correlated with tariff protection in consumer-good industries, especially convenience goods. Subsidiaries' shares in the Canadian market are positively correlated with seller concentration in the U.S. market but uncorrelated with concentration in Canada. Yet this lack of correlation across manufacturing industries as a group conceals a high negative correlation between foreign investment and concentration in convenience-good industries and a high positive correlation in other consumer industries. The convenience-good sector seems to conform to a familiar model of protected oligopoly, which asserts that subsidiaries in such sectors may use their skills at differentiating their products to crowd in behind the tariff wall and achieve profitable operation at relatively small scales of production.

We also saw that the small size of the Canadian economy has a number of important implications for the distribution sector. On the one hand, the combination of the small national market, a dispersed population and lower per-capita income levels reduces the economies of scale available to chain stores and diminishes the size of the average retail establishment; on the other hand, the chains that have grown large enough to exploit the available economies of scale are large relative to the market and account for high concentration of retailing companies at the national level. National market size also affects the markets in which buyers secure information, reducing the economies of national advertising and favoring local media not subject to scale economies. Therefore fewer national media are available, especially specialized magazines for consumers, and this may increase the effective cost of supplying advertising messages.

To place the role of market size in perspective, we sought (in Chapter 11) to indicate for size-related features of Canadian industries to what extent any given feature could be explained by factors varying among industries within Canada, and to what extent they are explained simply by a mean difference due to the size of the national market (and other economy-wide forces). Economy-wide forces account for 40 per cent of what we can explain about Canadian industries' concentration, as well at 58 per cent of the explanation of foreign ownership and 69 per cent of industries' value added per worker.

EVIDENCE ON MARKET PERFORMANCE

Our study dealt only with certain dimensions of market performance, omitting notably the question of distortions of allocative efficiency due to monopoly and market power. We did give considerable attention to organizational influences on the efficiency of Canadian industry (Chapter 11) and some to other dimensions of market performance.

A popular measure of industrial efficiency is value added per worker. In our statistical analysis it was negatively related to minimum efficient scale in the U.S. counterpart industry, positively related to relative Canadian wages (because wages are part of value added) and to the fraction of nonproduction workers in Canada relative to the United States (an indication of the weight of overhead costs).

We found relative productivity an unsatisfactory measure of efficiency differences between Canadian and U.S. industries. Partly this is because of technical problems with the measure. At an empirical level, it is deficient because it scrambles together efficiency differences due to differing sizes of establishments with differences due to other sources. Therefore we computed two other measures of relative labor productivity by finding the size of the median U.S. establishment (in terms of employment), splitting the Canadian counterpart industry into establishments larger and smaller than this U.S. median, and calculating relative productivities for the respective populations of "small" and "large" establishments in each country.

The relative productivity of small establishments in Canada is, as expected, negatively related to estimated minimum efficient scale in the United States. It is also negatively related to advertising and tariff protection--both of which increase the viability of companies too small to exploit the increasing returns available to them. The relative productivity of large establishments is positively related to diseconomies of small scale as revealed in the U.S. market; these diseconomies presumably crowd the larger Canadian establishments out to sizes that attain minimum efficient scale. It is negatively related to Canadian tariff protection and to the labor-intensity of industries in the United States. There is a further piece of evidence for our hypothesis that scale economies (especially when accompanied by large diseconomies of small-scale establishments) in the U.S. industry force Canadian establishments toward efficient scale and squeeze the variance of their sizes. The fraction of value added in Canada produced in establishments large enough to attain minimum efficient scale in the United States is greater, the greater are the cost disadvantages of the smaller establishments in Canada relative to the large ones.

Our studies also yielded somewhat incidental results on certain other dimensions of performance in the economy. Diversification does not increase the stability over time of large companies' sales, nor have the firms diversifying more heavily been the more profitable. Stability of sales does increase with the company's total size, although the stability of its profits does not--suggesting that large companies may undertake projects that are more risky in their long-run average rates of return even though size favors the short-term stability of sales. The burden of fixed costs is also negatively related to the stability of the company's sales. The growth rates of large companies are associated with the diversity that they have attained in their outputs but unrelated to the growth rates of shipments in their industries--suggesting that real economic growth and the growth of sales by large companies are not closely related.

Our studies offer only some incidental conclusions about whether allocative efficiency in Canadian manufacturing is distorted by market power. There is evidence (Chapter 10) that the profitability of large companies is increased by the standard sources of market power--seller concentration, scale economies, and advertising--but it is not particularly strong. We found that, when analyzing the profitability of Canadian companies, it is important to take account of their financial structures: profitability increases with leverage (ratio of debt to equity) up to a point because debt tends to be a cheaper source of funds, but higher leverage eventually reduces profits because it increases the bondholders' exposure to risk and elevates the supply price of debt capital. Our studies of the structural environment of competition in Canada contain implications for the determinants of market power that are too numerous to summarize. We must content ourselves with one example from Chapter 2: The lower level of chain-store penetration means that the prevalence of private-label merchandise, carrying the retailer's brand name, is relatively low. This favors the competitive strength and bargaining power of producers of branded merchandise and predicts that they would be more profitable than their U.S. counterparts who face stronger chains with better access to private-label goods.

PART ONE

COMPARATIVE STUDIES OF MARKET STRUCTURE

CHAPTER 2

THE COMPARATIVE STRUCTURE OF RETAILING IN CANADA AND THE UNITED STATES

M.E. Porter

The retail structure of an economy is the conduit between manufacturers of consumer goods and the ultimate buyer, and retailers are involved in transactions affecting a substantial proportion of a country's national income. In many studies of industrial organization, however, the retail stage has all but been ignored. Retailing is usually pictured as a collection of small powerless enterprises beset with the infirmities of small business generally. In most countries there has been considerable resistance to the substitution of large retail organizations for small local retailers, often spearheaded by the politically powerful small retailers themselves.[1] But other than providing for its preservation as a vestige of small business, retailing has been seen to raise no special problems for public policy.

This picture of retailing is increasingly inadequate. The chain retail store has risen as the retailing sector's answer to the large manufacturing firm, and chain development has occurred in varying degrees in nearly all classes of retail stores. In addition, the retailer's strategic position between the manufacturer and consumer yields the retailer substantial bargaining power through his influence on selling certain types of consumer products. This bargaining power can shape the way manufacturers distribute and market their products, and can provide a check against manufacturers' profits quite independent of the retailer's size. Thus the retail stage is of central interest insofar as it contains large enterprises, and insofar as it has the power to influence significantly conduct and performance in the manufacturing sector.

This chapter will examine the structure of the Canadian retailing system, with special emphasis on its comparison to the United States. The central questions examined are two in number. First, how has the development of the large retail firm in Canada compared to that in the United States and how can we explain this development? This question involves both an examination of the aggregate concentration of the retail sector as a whole and the penetration of the large, chain retailers in individual retail outlet classes. Second, how does the size of the Canadian retail establishment (or individual location) compare to that of its counterpart in the United States and why? In order to explain the differences in the two countries, and to make assessments for policy, it will be necessary to present a theoretical framework for explaining retail structure. While our data will not permit complete statistical tests of our hypotheses, they will provide a strong indication of the causes of basic differences in the retail structures of two economies. Since the structure of retailing can influence manufacturer behavior, our findings in this chapter will have significance for our study of comparative advertising behavior in the two economies described in Chapter 3.

SOURCES OF RETAILER POWER

A recent study by Porter[2] has presented a comprehensive theory of the sources of market power in the retail stage, and we will only briefly summarize the argument here. Retailer power derives from two basic sources, the structure of the retail system for a given product and the ability of the retailer to influence the buyer's choice among consumer goods by influencing product differentiation. The structure of the retail sector refers to the number and size distribution of retail firms for a given product, the degree to which multiple types of retail outlets sell the product, and the breadth of the retailers' product lines. As the retail distribution system for a product become more concentrated, the market power of the retail stage increases, other things being equal. Market power at the retail stage leads to increased retail profits, extracted both from consumers and from the manufacturers who supply the retailers' product. The relevant concept of concentration is different for retailers than it is for manufacturers, however. Concentration of sales in the largest retail firms is one important dimension of retail concentration. However, since most products are sold through many classes of retail outlets (e.g. cigarettes are sold through supermarkets, drug stores and tobacco shops), the concentration in the dominant retail outlet class for a product must be modified by the presence of alternative retail channels for the product. In addition, since the retail market for a product is never national but usually local, the concentration of retailers for a given product in the relevant retail market as well as in the national market is important. Finally breadth of a retailer's product line offers partial insulation against manufacturers' threats of withholding a product, and thus affects the retailer's bargaining position as well.

Thus, the presence of the large chain retail firm is accompanied by increased market power in the retail stage for a number of reasons. Increasing penetration of chain stores in a given retail outlet class increases concentration in that class, and thereby increases its power vis-à-vis the manufacturing industries whose products it sells. If chain stores have broader product lines than independent retailers and/or reduce the number of alternative channels of distribution the manufacturer has available, this increases retailers' power with their supplying manufacturers as well. If the individual establishments of chain retailers are larger than those of independents, concentration in the local retail market may increase as well.

The retailers' power over product differentiation is derived from the information-gathering process consumers go through in choosing among competing brands of products. While we will examine this process more fully in Chapter 3, certain elements are important here. If information were costless for the consumer and no uncertainty existed, he would consider all product attributes in his purchase decision among brands of a product and would employ the full range of sources of information available about all the attributes. When gathering information is costly, however, the consumer's buying behavior will depend on the balance between his perceived incremental benefits and the costs of gaining product information. Gaining information about some attributes (reliability) is more costly than gaining information about others (brand image). This tradeoff will, in general, vary across products, with the result that the attributes on which choice is based will vary.

The retailer's contribution to product differentiation is the influence he exerts on the purchase decision of the consumer. This influence is applied in two major and interacting ways. First, the retailer controls or embodies some of the attributes which the consumer may desire in the product. The store's reputation and image may reflect on the quality and image of the product. The physical amenity of the store as well as the quantity and quality of attendant services provided by the retailer (credit, billing, delivery, warranty, repair) comprise attributes of the product in the eyes of the consumer in much the same way as do price, packaging or advertising image.

The second way in which the retailer can influence the sale of the product is through the provision of information. The salesperson in the store can have a major influence on the brand of product the consumer buys. This influence is wielded through the selling presentation and personal recommendation, or the perceived expertise of the salesperson with respect to the product. The retailer conveys information about the product's reliability, features and method of use that may be difficult to obtain from other sources.

The importance of the retailer's selling efforts and his control of product attributes depends on the consumer's process of choice. The consumer is willing to expend varying amounts of effort (cost) in buying different products and considers varying sets of attributes. The retailer will be more or less influential in the purchase decision, depending on (1) the importance of product attributes controlled by the retailer, (2) the perceived benefits of the range of product information disseminated by the retailer relative to the availability and cost of other sources of information, and (3) how large an investment in information the consumer will make. If the amount of effort the consumer is willing to expend on selection is relatively large, he will shop several retail outlets in order to compare brands and solicit product information from the retailer, and the retailing sector will be influential in product differentiation.

Recognizing that buying characteristics vary from product to product is only the first step. What is needed is a way of identifying and measuring the economically relevant differences. The discussion above suggests a way: the characteristics of the retail channels for a product will signal the relevant characteristics of consumer demand for that product. Although the economically significant differences in buyer (and retailer) characteristics might be quite numerous, a principal dichotomy emerges between two types of retail outlets: convenience and nonconvenience outlets.

Convenience outlets are retail outlets where little or no sales assistance (information transfer) in the form of salesperson interaction is provided with the sale, and the locational density of outlets is high.

Nonconvenience Outlets are retail outlets where sales assistance (information transfer) is provided with the sale, and outlets are selectively rather than densely located.

Examples of convenience outlets are supermarkets, gasoline stations and liquor stores. Examples of nonconvenience outlets are furniture stores, appliance stores and automobile dealers.[3]

Products Sold Through Convenience Outlets

The convenience outlet provides little or no information with sale and is located close to the buyer. For products sold through convenience outlets ("convenience goods"), low unit price and frequent purchase of the product reduce the desire of the consumer to expend effort on search. As signalled by the characteristics of the outlet, the consumer demands a nearby retail outlet, is unwilling to shop around, and desires no sales help. Thus the consumer considers the purchase relatively unimportant, and is willing to rely on less costly sources of information, such as advertising, in making his purchase. Relatively costly information sources such as sales assistance by the retailer and direct shopping and comparison are not used by the buyer.

In view of these buying characteristics, the manufacturer's prime strategy for differentiating his product is to develop a strong brand image through advertising. If the manufacturer can develop a brand image, the retailer has very little power because:

(1) The retailer is little able to influence the buying decision of the consumer in the store, and

(2) A strong manufacturer's brand image creates consumer demand for the product, which assures profits to the retailer from stocking the product and at the same time denies him the credible threat of withholding stocking the manufacturer's goods. In view of the consumer's buying behavior, convenience outlets are densely located to be in close proximity to the consumer.

Products Sold Through Nonconvenience Outlets

The purchase of a nonconvenience good is relatively large, postponable, and infrequent. The buyer views it as important and expends effort in comparing the various alternative goods available. The buyer's intentions and plans to purchase are more likely made in advance of purchase. Although advertising and product differentiating activities of the manufacturer can induce the consumer to consider a particular brand or to visit a store that carries it, the consumer's buying decision involves more. A critical adjunct to the information the consumer has from experience or media sources is physical demonstration and inspection of the product, the advice and counsel of the sales person and the reputation and attendant services provided by the retail outlet. Thus the nonconvenience retailer has substantial power to influence the sale of the product.

The essential notion in the model for nonconvenience goods is the necessity of sales promotion for both manufacturer and retailer. Even if the manufacturer advertises heavily, the policies of his retailer are critical to his success. A good brand image is not enough, and conventional measures of a manufacturer's market power based on his own efforts to

differentiate are inadequate. The manufacturer must direct his efforts towards convincing the retailer to stock and promote his product as well. For nonconvenience goods, selective rather than intensive retail coverage of the market becomes important. The consumer is willing to travel to seek out product alternatives, and hence the manufacturer needs to have a few well-chosen outlets rather than a large number of outlets.

The small size of the retail market, constrained by the buyers' need to physically travel to the store, provides barriers to entry into retailing by implying that a local retail market can support only a few outlets. Thus entry of new firms does not remove the bargaining power of nonconvenience retailers vis-à-vis manufacturers. See Porter (1976), Chapter 2.

Thus, our analysis illustrates that substantial power accrues to the retailer from his ability to influence the differentiation of consumer goods, but that this power differs markedly between convenience and nonconvenience goods. The two types of retail outlet classes also differ in a number of other dimensions, including the amount of personal service provided, locational density, and so on.

THE INCIDENCE OF CHAIN STORES WITHIN AND ACROSS COUNTRIES

Chain stores give rise to power in the retail sector, yet even casual observation suggests that the penetration of chain stores varies in two important dimensions. First, the penetration of chain stores varies markedly across retail outlet classes in a given country, and Canada is no exception as our data will show. Second, the degree and pattern of chain store penetration varies among different countries. As preparation for examining the differences in the multi-unit structure of retailing between Canada and the United States, we must examine the theoretical reasons why we would expect chain store penetration to differ along these two dimensions.

THE INCIDENCE OF CHAINS IN A GIVEN ECONOMY

We will begin by considering the question of why chain store penetration varies among retail outlet classes in a given economy. As we will see, this question is closely related to that of the trans-national differences in chain store penetration, because many of the reasons some areas of retailing are particularly hospitable to chain stores will also provide key characteristics of national economies with respect to chain store development.

Since the size of an individual retail market is constrained by the requirement that consumers travel to the retail outlet, there are strong limits to the size of the individual retail establishment. The large retail firm arises only when a large number of retail establishments are grouped within a single administrative unit. There are generally two essential consequences of such a grouping--vertical integration into the wholesaling function, and the centralization of certain administrative functions at the firm rather than the establishment level. The analysis of the incidence of chain retail firms is thus a problem in the theory of the scope of the firm and the relative efficiency of transactions via market mechanisms

and administrative mechanisms. The penetration of chain stores in a given retail outlet class will depend on the balance between the pecuniary and non-pecuniary economies of scale due to large firm size and the information, coordination, and transaction costs of administrative (versus market) operation.

Reflecting this tradeoff, there are a number of conceptually separate conditions that give rise to chain stores, whose strength determines both the degree of chain penetration in a given retail outlet class and those retail classes where chain penetration occurs first.[4]

1. Economies of Mass Physical Distribution (vertical integration into wholesaling): By carrying out its own warehousing and distribution, the chain store offers potential for economies of physical distribution over single retail outlets. Manufacturers ship goods in high volumes to the chain's warehouses rather than in small volumes to the independent outlets, and the chain is able to economize by shipping full lots of mixed merchandise from its warehouse to its individual locations. Even if the wholesaling function is perfectly competitive, independent wholesalers carry product lines not in general corresponding exactly to that of a particular retailer, and thus cannot perform as efficiently as the manufacturer himself. In addition, the independent wholesaler cannot align the location of his warehouses and logistics system to the outlet configuration of a particular retail chain, making them an inferior substitute for the retail chain's own warehouse and logistics system. Contractual difficulties explain the difficulty in a wholesaler specializing in only one particular retailer.[5]

Where the volume of goods in a retail outlet class is large, and the assortment of goods demanded is relatively wide, standardized across geographic areas and relatively stable over time, these economies in centralized distribution by chains may be substantial. High unit sales volume of individual products as well as for the store as a whole is a reinforcing condition.

Where unit sales volume is relatively low and the retailer's product line narrow, significant economies are unlikely to be present, in the first case because the potential for volume shipping by chains is limited, and in the second case because direct manufacturer distribution is efficient in narrow line outlets. In addition, where each geographic area requires a different assortment of goods or where products in the line are subject to rapid obsolescence due to styling or product innovation, chain store economies are also likely to be limited. Such factors signal the presence of substantial coordination, information, and transaction costs of mass distribution within the administrative unit.

2. Non-Logistical Economies of Scale: Quite apart from economies in centralized wholesaling, the chain store may gain efficiences in the standardization of store design and operating procedures, and in centralization of functions such as training, credit, merchandising, marketing, and top management. Standardization facilitates management control, and personnel

replacement, and may lead to economies in planning and constructing new outlets. Centralization of functions can lead to economies through increasing specialization of labor (e.g., specialists in credit or advertising) and spreading of fixed costs. Potential economies of both standardization and centralization may be particularly great for chain retailers relative to manufacturing since the large chain retailers encompass a very large number of individual outlets.

The available economies of centralization are closely limited by the possibilities for standardization. In retail outlet classes where individual locations (establishments) can be standardized across geographic areas, centralized training, credit, marketing, and so on will be most pronounced. However, if outlets cannot be standardized because of differences in local market conditions, the costs of information and coordination reduce the efficiency of chain retailers relative to independent local stores. Differences in local conditions requiring variations in marketing, product assortment, credit policy, etc., also negate economies in centralization of these functions, and reduce the efficiency of centralized training and management development. Thus chain penetration will be less in retail outlet classes where local variations in taste or consumer buying behavior are great. These variations will be reflected by differences in the assortment of goods demanded, their styles and varieties, and the services expected of the retailer.

3. Low Levels of Personal Service Required at the Retail Level. The chain store gains efficiencies through standardization and routinization. Where personal service in selling is important in the retail outlet class, the opportunities for such efficiencies are limited. There are few, if any, economies of scale in providing personal service, and if personal service is an important area in a given retail outlet class it means that the cost of personal service generally represents a substantial portion of the retailer's operating costs. Hence, the importance of economies gained by the chain retailer due to the efficiencies discussed above is reduced in relative terms. In addition, the importance of personal service in the retail outlet class is usually associated with the requirement that other non-logistical functions such as marketing must be carefully tuned to each store location, thus reinforcing the lack of chain store economies in such retail outlet classes.

4. Pricing Can Be Easily Centralized, since competing retailers often sell identical products, pricing becomes a central aspect of marketing strategy for the retailer. The efficiencies of chain store operations are maximized where pricing can be centralized like the other retailer functions mentioned earlier. The ability to centralize pricing does not provide an economy so much as it is the absence of a diseconomy in administering a multi-unit system. Centralized pricing is facilitated by a stable assortment of goods, lack of demand fluctuations, and homogeneity of market conditions across individual selling locations.

5. Achievement of Purchasing Economies following directly from our discussion of the sources of retailer power, chain retailing is promoted by the potential for achieving both pecuniary (quantity discounts) and non-pecuniary (monopsonistic) purchasing economies through increasing size of the retail firm. The motivation is likely to be most significant where the

retail outlet class distributes a relatively large portion of the outputs of the manufacturing industries from which its goods are purchased. The chain store may also gain purchasing economies in other inputs besides the goods it resells, such as capital, supplies, etc.

The conditions supporting the development of chains are largely based on real economies of multi-unit operation. Thus the increased market and buying power that chains possess must be weighed against their social benefits.

It is instructive to examine the conditions facilitating chain stores to see how they relate to our two types of retail outlets, convenience and non-convenience outlets. The power of convenience outlets to influence differentiation is low, and the personal service provided with sale is correspondingly minimal. Both these conditions support the development of chains. Convenience outlets also have much to gain by achieving structural power due to size, since they lack power to influence the consumer's purchase decision. Their low personal service component, coupled with the high unit volumes and broad product lines that go hand in hand with convenience-motivated purchasing by the consumer, may make the economies of centralized distribution potentially large. The relatively small influence of convenience retailers on product differentiation also generally means that convenience outlets can be standardized across geographic areas, increasing the likelihood of nonlogistical economies of scale. The high locational density of convenience outlets enhances this potential even more, since the chain convenience retailer may have many locations even in a given geographic area.

Nonconvenience outlets present quite a different situation, however. Their key characteristic is a high personal service content, which limits the relative significance of multi-unit distribution economies and tends to work against economies of standardization and routinization. We should expect to see chain stores in nonconvenience goods primarily in those nonconvenience outlet classes where the assortment of goods is very broad (e.g., department stores), where unit sales volumes in individual products are high (e.g., shoe stores) and where personal selling is the least important. On the whole, chains should be much less developed in nonconvenience goods than in convenience goods. Thus while market power due to influence on product differentiation is greater in nonconvenience goods, structural market power due to chain retailers should be less for these goods.

Chain Store Penetration and the Size of Chains

The conditions described above reflected the balance of the economies of large size in the retail firm with the need for local information and the coordination and transactions costs of operating multiple units. In addition to providing predictions about the penetration of chains generally, these conditions also carry some implications for the size of the retail chain and its geographic configuration.

A retail chain can consist of two to thousands of individual stores and as many geographic locations. The economies of distribution and centralization are likely to increase monotonically with the number of locations the retail firm operates, other things being equal, and so are the economies in purchasing.

Offsetting the growth of chains are the requirement for personal service and the diversity of consumer tastes and buying characteristics among locations. Although the requirement for personal service is probably invariant with number of locations, the retail chain can minimize diversity by operating locations only in a relatively narrow geographic area, or in areas carefully selected for the homogeneity of their customer base though they may not be geographically contiguous. While very large chains will not be efficient in retail classes where important customer diversity exists then, small and medium sized chains may flourish if other conditions support their presence. In retail classes where customer diversity is not important, the monotonically increasing economies of chains up to a large number of locations will lead to the dominance of large chains over small and medium sized ones. Thus both the overall penetration of chains and their size distribution reflect the balance of forces promoting and deterring the multiple location retail firm.

A good example of these ideas taken from the United States is the penetration of chains in department stores and clothing stores. In both of these areas, especially department stores, a significant amount of chain store penetration is present. But because of the extreme importance of style and local tastes in these retail classes, chains tend to be composed of a relatively small number of locations compared to supermarket and drug chains. Within department stores, segments of the industry catering to the broad middle and lower income market such as Sears and Montgomery Wards, have a large number of locations, while firms emphasizing style and fashion and catering to the upper-income markets have far fewer individual locations. Discount department stores, selling nationally branded goods to a broad market based on price and de-emphasizing style, also have greater numbers of locations than do the high quality department store chains. Many of the high quality chains consist solely of a main downtown store with suburban branches, reflecting the principle of minimizing diversity through constraining operations to one geographic area.

INTERNATIONAL DIFFERENCES IN CHAIN STORE PENETRATION

The conditions described above determine the balance between chain stores and independents and the size and geographic configuration of the chains. For a given country, they should be reflected in variations in chain store penetration among different retail outlet classes as compared to the retail sector as a whole. Across countries, both the mean level of chain store penetration and the distribution around the mean will be affected by underlying demographic, social, technological and managerial factors which influence the degree to which the economies of chain stores can be realized, and the size of coordination and transactions costs working against chain store development. The key cross-country differences can be divided into four major categories[6]: consumer buying behavior, population location patterns, nature of the logistical system, and managerial techniques. In general, what might broadly be termed industrialization is favorable to chain store penetration, though there are some demographic and geographic conditions that seem to act as constants in determining the underlying potential for chain stores in a given country. We shall briefly examine these four major areas in general terms, and then consider the specific differences between Canada and the United States.

Buyer behavior may vary markedly across countries along a number of dimensions important to chain-store development. The requirement for personal service will vary depending on the expertise of the local consumer, the perceived value of the consumer's time spent purchasing, and the consumer's risk aversion in purchasing decisions. These reflect income levels, education levels and other socioeconomic factors. The consumer's mobility and therefore relative confinement to a given geographic area for purchasing will also vary. In countries where buyers are not mobile, have low income levels, and shop frequently for small quantities and where buying is considered an important activity with a low cost in time spent, chain stores may find conditions less favorable to their development. The buyer in such situations will be risk averse, will demand personal service, will engage in extensive comparison among stores and will have a strong local orientation in purchasing, preferring the local merchant to the impersonal chain store. A less developed country such as Nigeria provides a polarized example of this tendency, chosen to highlight the point. There the retail sector is composed of a vast number of small merchants operating in stalls in local markets and a few chains catering to foreigners and wealthy Nigerians.[7]

In addition to the propensity to shop and risk aversion of buyers, the diversity of buyer tastes and buying characteristics within a given country varies across countries. Some countries have common languages, backgrounds, and so on, while other countries are composed of buying groups differing widely along cultural dimensions. The variance of income levels, education levels, mobility levels, and so on, will also differ across countries. The more diverse the population of buyers along all these dimensions, the lower chain-store penetration is likely to be.

Population patterns. Population and hence store location patterns affect the potential for physical distribution economies, as well as economies in standardization. Intensive store density reflecting dense population means that the chain retailer can distribute to clusters of contiguous stores rather than widely separated individual stores. In addition, the fact that there are numerous stores in any given broad geographic area heightens the possibility that selling, marketing, and so on, can be standardized in that area. If population is widely dispersed and stores of a given type are few and far between, the chain retailer's cost of distributing goods to a group of stores may not be significantly lower than the costs of serving them individually through wholesalers or the manufacturer directly.

Logistical efficiencies. The potential for logistical efficiencies relates to the state of transportation and distribution systems in a country. Logistical efficiencies are maximized by large transportation vehicles, well developed highway and other transportation systems, sophisticated refrigeration and storage techniques, etc. Facilities for high-speed communication also are important for effective chain-store operation. To the extent that a country lacks fully developed facilities along these lines, the potential economies of chain stores are reduced. The size of a country in national product terms affects the economies in distribution appropriable to chains. The chain store incurs a fixed cost in establishing the facilities to distribute goods internally, while distribution by manufacturers or wholesalers is a variable cost to the retailer. If the small size of the market

reflects small retail sales in individual retail markets, the lack of physical volumes necessary to overcome these fixed costs may work against chain development.

Finally, achieving the efficiencies of multi-unit operation requires substantial managerial sophistication in areas such as inventory control, pricing, purchasing, and managing a logistics organization, all on a large scale. The ability to make use of electronic data processing and communication systems facilitates chain store economies. As the state of managerial practice varies across countries in these areas, the potential for chain stores also will vary.

Canada differs from the United States in a number of these dimensions, though far less than do most other countries. Table 2-1 compares a number of statistics for the United States and Canada for the period under investigation. Canada has somewhat lower disposable income per capita and per household, and lower levels of average education, both tending to lower the perceived cost of time spent shopping. There is less ownership of two or more automobiles per household in Canada, and a lower percentage of females in the labor force. These figures support greater time spent shopping, and a more local orientation in shopping. Taken together, these buyer characteristics suggest lower chain penetration in Canada.

In addition to differences in average buying characteristics, there is substantial evidence that buyer taste varies proportionally more in Canada than in the United States. Numerous commentators point to fundamental language and cultural differences among Canadian regions, exacerbated by their geographic separation. Some authors also argue the related point that ethnic groups are less assimilated in Canada and thus that even in given regions buyer diversity is greater.[8] Within Quebec, for example, there are strong language and cultural differences. Buyer diversity would also suggest lower chain penetration in Canada, particularly of chains that operate in more than one region.

Canadian population is more geographically dispersed, farm population is proportionately greater in Canada, and there are fewer people in urban areas with 50,000 population or over. This greater population dispersion reduces the potential logistical economies of chain stores in Canada relative to the United States. The size of the Canadian economy is considerably smaller than that of the United States and many areas have small retail volumes, further reducing relative chain-store potential. In addition, the distribution of Canada's population along a long linear east-west band means that the number of alternative transportation routes to major urban areas is less than in the United States.[9] This increases the risk of the disruption of transportation due to weather and other reasons and reduces the logistic flexibility in Canadian distribution arrangements, both of which would impede the logistical efficiencies of chains.

While we expect the penetration of chain stores to be generally lower in Canada, the concentration of retail sales of the leading chains in a retail outlet class may be higher than it is in the United States for essentially the same reasons we expect concentration in manufacturing to be greater in Canada (see Chapter 11). If there are economies of scale in

Table 2-1 Buyer and Market Profiles in the United States and Canada

DEMOGRAPHIC CHARACTERISTICS	CANADA	U.S.A.
Population - Canada as % of U.S. (1970)	10.4%	100.0%
Ten Year Rate of Population Growth (1960-1970)	18.0%	14.3%
Percent Farm Population (1966)	9.6%	5.9%
Percent Standard Metropolitan Area (50,00 pop. & over, 1970)	61.5%	73.5%
Percent Under 15 Years (Canada 1969), Under 16 years (U.S. 1969)	31.0%	31.0%
Persons per household (1970)	3.7	3.2
Percent Single Marital Status (Canada over 14 years, U.S. over 13 years)	28.0%	24.0%
Percent Roman Catholic Religion (1960 U.S. - 1961 Canada)	45.7%	26.0%
Percent Labour Force (Male) - Completed 4 years H.S. only	8.7%	24.6%
Percent Labour Force (Male) - Completed University	5.6%	11.1%
ECONOMIC CHARACTERISTICS	(% or Can. $)	(% or U.S.$)
Effective Buying Power		
per capita (personal disposable income)	$ 2,481	$ 3,308
per household (personal disposable income)	$ 9,895	$10,565
Median Income of Individuals completed 1-3 years H.S. (1960)	$ 4,233	$ 4,936
Median Income of University Graduate (1960)	$ 7,956	$ 7,693
1971 GNP (Estimate by Businessweek)	$87.7(Bil)	$1,045(Bil)
Average Annual Percentage Increase in Real GNP (1960-67)	5.5%	4.7%
1971 over 1970 Gross National Product (Estimate)	6.7%	7.0%
1969 over 1965 Disposable Income	44%	33%
Households with 2 or more cars (1969)	16.0%	29.0%
CONSUMPTION CHARACTERISTICS		
1969 Per Capital Personal Expenditures	$2,216	$2,834
Durable Goods	$ 520	$ 441
Nondurable goods	$ 854	$1,200
Services	$ 842	$1,194
Percent female population in the Labour Force (1962)	19.5%	25.9%
Number of radio sets in use (per 1,000 pop. - 1962)	504	1,006
Number of T.V. sets in use (per 1,000 pop. - 1962)	235	322

Source: B. Mallen, "Just How Different are U. S. and Canadian Retailing and Their Markets," Business Quarterly (Winter 1971), pp. 52-59.

chain-store operations, Canada's greatly smaller retail market will lead to higher retail concentration if the factors limiting chain stores' economies in Canada do not reduce them proportionally. Thus in retail outlet classes where chain-store economies are present, we should expect to see proportionally larger Canadian retail chains but a greater percentage of retail sales passing through independents. The limits on chain economies are most severe in Canada's sparsely populated extreme eastern and western reaches, and least severe though not absent within the provinces of Ontario and Quebec. Thus smaller chains may develop within the provinces in many retail outlet classes, though the percentage of total retail sales they command in the outlet class nationally will reach a peak sooner than it will in the United States.

While a number of factors point to greater chain penetration in the United States than in Canada, it is also true that the differences in some of the variables discussed above for the two countries have been narrowing steadily over the last two decades.[10] For example, Table 2.1 shows that disposable income increased faster in Canada than in the United States between 1965 and 1969. Thus while we should expect chain-store penetration in Canada to be generally less than that in the United States, we should also expect the differential to be narrowing in some areas.

COMPARISON OF CHAIN-STORE PENETRATION IN CANADA AND THE UNITED STATES

To examine the incidence of chain stores in the Canadian economy and the comparative penetration of chain stores in Canada and the United States, we assembled data on the sales of chain stores as a percentage of total sales in a wide variety of Canadian retail outlet classes matched to U.S. outlet classes. Data on Canadian chain-store penetration was compiled from a Canadian Census and the Dominion Bureau of Statistics, *Retail Trade: Revisions to Postcensal Estimates*, and data on U.S. chain-store penetration was taken from the U.S. Bureau of the Census, *Census of Business*. While data on chain-store penetration in the United States was quite complete, Canadian data on multi-unit development in retailing gave no further detail beyond chain stores of 4 units or larger. Thus using Census sources it was only possible to examine the proportion of sales of Canadian retail classes accounted for by all chains and not the concentration of sales in the very largest chains. Since we expect the concentration of sales in the largest chains to differ between Canada and the United States, we also performed an analysis of the proportion of retail sales accounted for by Canada's top 20 retailers relative to a similar group of retailers in the United States. While this analysis did not include the leading firms in many retail outlet classes, it is suggestive of the relative top-end concentration in Canadian retailing generally.

COMPARATIVE PENETRATION OF ALL CHAINS

We examined the penetration of chains in matched retail outlet classes in the two countries to control for differences in the mix of retailing activity, and more importantly to control for the basic nature of the retail channel and the buying characteristics of its shoppers that should affect the relative efficiency of chain stores and independents as discussed above.

While the classification systems for retail outlets varied to some extent between the two countries, it was possible through comparison of outlet class definitions to construct a sample of matched retail outlet classes. While matched classes were quite similar, small differences in some classifications remain and they should temper the interpretation of the results.[11] The U.S. classification is generally less aggregated, though the Canadian system has become less aggregated over time and different Canadian data are presented at different aggregation levels. As a result, the group of matched outlet classes varies from year to year.

Besides the differences in classification, there was another difficulty in constructing comparative retail data. The Canadian and U.S. Census years do not coincide, and, while some Canadian data were available for each year and could be exactly matched to the U.S. Census data, other statistics could be obtained only for Canadian Census years. Thus some of the comparative data involve comparisons of closely adjacent though not identical years.

Tables 2.2 and 2.3 give comparative sales penetration of chain stores by matched retail outlet classes in Canada and the United States during the period 1951-67. Table 2.3 compares sales of single units, chains with 2 or 3 units and chains with 4 or more units by outlet class; while Table 2.2 compares only sales of chains of 4 units or above with those of other retail firms by retail outlet class. All available data have been presented even where data for a given retail outlet class were not available throughout the entire period.

The data show the substantial degree of chain-store penetration in Canadian retailing. Chain penetration is greatest in food, general merchandise stores, and clothing. Despite the geographic and cultural diversity of Canada, Canada's retailing system exhibits a relatively high degree of concentration compared to that of other industrialized countries.

The data also generally confirm our earlier predictions about comparative chain penetration in Canada and the United States. For the 14 matched retail outlet classes in Table 2.2, 10 have greater chain-store penetration in the United States than in Canada throughout the period for which data was available. In 4 retail outlet classes, Canada has greater chain-store penetration: variety stores; general merchandise stores; furniture, TV and appliance stores; and jewelry stores. This general pattern is reinforced by the more detailed data in Table 2.3. Of the 24 retail classes for which comparison could be made in some year, the United States had greater chain-store penetration in 15, Canada in 9. Of the 9 classes where Canada led, 3 were based on only a single year's data (1951-1954 comparison), while only 3 of the 15 classes where the United States led were based on a single comparison period. Thus chains have achieved less penetration in Canada's retail sector, consistent with the factors suggesting lower chain-store economies in the Canadian economy.

The trends in the data, though subject to only imprecise measurement, show the United States gaining ground generally. Canadian chain-store penetration appears to be catching up with that of the United States in "Other food stores" and fuel dealers, but the United States appears to be

Table 2-2 Comparative Sales Penetration of Chain Retailing in Matched Retail Outlet Classes for the Years 1954, 1958, 1963 and 1967.

Class of Retail Outlet	Percent Chain Sales to Total Sales 1954		Percent Chain Sales to Total Sales 1958		Percent Chain Sales to Total Sales 1963		Percent Chain Sales to Total Sales 1967	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
Total Retail	26.6	23.7	28.6	26.8	30.8	30.1	33.9	34.0
Grocery Stores	37.9	43.3	43.8	48.2	46.0	51.9	45.9	56.1
Other Food Stores	4.6	6.8	52.5 1/	10.1	5.7	15.4	10.7	14.5
General Merchandise Stores							73.7	8.6
Variety Stores	83.2	79.7	38.9	81.0	82.3	81.0	87.4	81.4
Motor Vehicle Dealers	1.0	1.1	1.0	1.2	1.1	1.2	1.5	3.2
Service Stations	0.8	8.1	0.5	9.7	1.1	11.5	3.9	12.8
Men's Clothing	12.2		12.3	18.8	12.2	22.9	12.5	26.2
Women's Clothing	24.8		29.5	34.6	29.9	36.6	30.3	38.0
Family Clothing	11.5		19.8	31.6	20.5	36.4	19.7	42.2
Shoe Stores	37.6	46.3	43.7	48.2	42.9	51.0	45.6	53.2
Furniture, TV and Appliance	19.7	10.6	22.7	12.7	15.9	14.1	17.8	16.2
Fuel Dealers	1.3	9.8	2.0	10.5	7.8	13.36	14.0	18.4
Drug Stores	12.7	19.9	13.0	23.0	12.2	26.1	13.7	33.7
Jewelry Stores	33.7	13.5	35.3	15.7	28.9	20.1	33.3	20.9

1/Figure for 1958 is not comparable due to classification change.

Sources: U.S. Bureau of the Census, Census of Business, Chapter 4, pp. 1-7 (1954), Chapter 4, pp. 1-32 (1958), Chapter 4, pp. 1-37 (1963), Chapter 4, pp. 9-33 (1967).

Dominion-Canadian Bureau of Statistics, Retail Trade 1954, p. F-10
Dominion-Canadian Bureau of Statistics, Retail Trade 1958, p. 8
Dominion-Canadian Bureau of Statistics, Retail Trade 1961-64, pp. 6-9
Dominion-Canadian Bureau of Statistics, Retail Trade: Revision to 1966-1970 Postcensul Estimates, July 1971, p. 16-18.

Table 2-3 Comparative Chain Store Penetration for Matched Retail Outlet Classes in Canada and the United States in Adjacent Census Years

Type of Retail Outlet (Figures are percentages of Total Sales in the Retail Outlet Class)	1951 Can. % Sales Single	1951 Can. % Sales Small-Multi	1951 Can. % Sales Chain	1954 U.S. % Sales Single	1954 U.S. % Sales Small-Multi	1954 U.S. % Sales Chain	1961 Can. % Sales Single	1961 Can. % Sales Small-Multi	1961 Can. % Sales Chain	1963 U.S. % Sales Single	1963 U.S. % Sales Small-Multi	1963 U.S. % Sales Chain	1966 Can. % Sales Single	1966 Can. % Sales Small-Multi	1966 Can. % Sales Chain	1967 U.S. % Sales Single	1967 U.S. % Sales Small-Multi	1967 U.S. % Sales Chain
Total - All Stores	78.3	5.0	16.7	69.8	6.4	23.7	63.7	4.9	31.4	63.3	6.4	30.1	61.8	5.2	33.0	60.1	5.8	33.9
Bakery Products	70.0	5.1	24.9	75.2	8.1	16.5	76.1	8.7	15.2	73.8	9.1	17.0	80.0	7.0	12.9	78.9	5.7	15.2
Candy, Nut & Confectionery Stores	92.4	1.8	5.7	74.9	2.6	22.4							50.7	3.7	45.6	64.8	2.6	32.6
Grocery Stores	64.9	2.3	32.2	51.8	4.9	43.3	50.3	3.4	46.2	43.1	5.0	51.9	47.7	4.7	47.5	38.8	4.9	56.4
Meat & Fish Markets				85.1	8.1	6.7												
Meat Markets	90.2	5.9	3.9				89.8	6.5	3.7	87.7	6.6	5.6						
Fish Markets	87.2	10.9	1.9															
Eating Places	88.9	3.7	7.0	83.3	5.5	11.1												
General Merchandise	82.8	4.0	13.2	63.8	6.9	29.2	62.3	8.6	29.1	51.0	7.6	41.3	24.1	3.0	72.9	48.2	6.2	45.4
General Stores	87.0	5.7	7.3															
Variety Stores	12.4	3.5	84.1	17.1	3.1	79.7	14.8	1.5	83.7	16.1	2.8	81.0	11.7	1.6	86.7	16.8	1.7	81.4
Automobile Dealers - New	93.5	5.1	1.4	95.2	3.7	1.0												
Used Car Dealers	96.8	2.4	.8	21.4	8.1	.4												
Accessories, Tire, Battery Stores	77.4	5.9	16.7	57.6	6.4	35.9	7.66	5.3	18.1	60.8	7.9	31.2	71.0	8.0	21.0	56.3	6.3	37.3
Service Stations	97.2	1.6	1.2	87.3	4.4	8.1							92.7	35.1	3.8	83.4	3.8	12.8
Men's & Boys Clothing Stores	74.2	11.6	14.0				75.5	12.1	12.4	63.4	13.0	23.5	75.6	13.5	10.9	62.9	10.4	26.7
Women's & Misses Ready-to-Wear	72.8	14.0	13.2				55.7	12.4	31.9	48.2	13.6	38.1	60.2	15.8	24.0	49.4	11.7	38.7
Millinery Stores	84.8	8.6	6.6															
Lingerie & Hosiery Stores							79.1	6.2	0.0									
Children's & Infant's Wear	87.9	9.4	2.7															
Family Clothing Stores	64.9	13.5	21.6				67.8	9.8	22.4	45.8	12.5	41.5	52.2	14.[illegible]	33.8	41.2	12.3	46.3
Shoe Stores				43.6	10.0	46.3	45.0	12.9	42.1	39.1	9.4	51.0	43.2	1[illegible].9	45.0	39.3	7.4	53.2
Men's Shoes	52.1	11.2	36.7															
Women's Shoes	68.3	28.8	2.9															
Family Shoes	51.6	11.9	36.5															
Lumber & Building Materials	68.5	10.2	21.2	75.8	9.6	14.4												
Plumbing, Electrical, Paint, Glass, Wallpaper				78.8	5.9	15.1												
Plumbing & Electrical Stores	93.7	4.8	1.3															
Paint, Glass, Wallpaper Stores	78.3	13.9	7.8															
Hardware Stores	84.3	7.6	8.1	81.4	5.2	13.3	85.4	7.1	9.5	85.5	7.5	6.8	76.1	8.0	15.9	86.2	5.7	7.9
Household Appliance Stores							66.5	1[illegible].1	23.4	67.1	10.2	14.1						
Furniture Stores	65.2	10.7	24.1				69.4	14.6	15.8	73.3	12.4	22.5	67.0	15.1	17.7	71.6	12.1	16.2
Drug Stores	75.6	11.7	12.5	73.1	7.0	19.8	77.9	9.9	12.0	66.6	7.2	26.1	76.5	10.3	13.2	60.2	6.0	33.7
Opticians	71.7	17.0	11.3															
Fuel Dealers			2.2	82.0	8.0	9.8												
Farm Implement Dealers	96.6	3.3	.1	90.5	6.6	2.9												
Florists	89.8	9.7	.5	91.8	7.2	1.0												
Luggage & Leather Goods Stores	71.8	16.1	12.1															
Tobacco Stores & Stands	73.9	3.8	22.3	80.8	3.2	15.8												
News Dealers	67.4	7.0	25.6	80.3	2.7	16.8												
Gift, Novelty & Souvenir Shops	95.0	3.2	1.8	91.8	5.9	2.1												
Jewellrey Stores	60.3	10.0	29.7	76.1	10.3	13.4												
Sporting Goods			1.0															

catching up in furniture, TV and appliance stores, and jewelry stores and is getting further ahead in most other retail classes as Canada's chain penetration appears to be leveling off. While Canada's chain-store development has closely followed that of the United States, it appears to be reaching its potential sooner or at least reaching a plateau sooner.

Examining the retail outlet classes where Canada has greater chain-store penetration, it is clear that they are primarily in the nonconvenience outlet classes and especially the nonconvenience outlet classes where personal service is relatively more important. Canada has greater chain-store penetration in jewelry stores, general merchandise and variety stores, hardware, lumber and building materials and furniture and appliances, while the United States has greater chain-store penetration in all the convenience retail classes in addition to classes such as shoe stores and clothing stores, where the purchase is heavily based on style, and the role of the salesperson is diminished as a source of information and advice to the buyer. The United States also leads in some of the high personal-service outlet classes, such as motor vehicle dealers and tire, battery and accessory stores.

Canada's greater chain penetration in some nonconvenience retail classes where chain-store development would seem to offer the least relative efficiencies must be interpreted with some caution, since these outlet classes are likely to have relatively smaller chains, and the differences between two countries may be sensitive to the number of locations per chain used as the cutoff point. However, if our earlier discussion about the likely lower chain penetration in Canada is accurate, the retail classes where Canada leads are telling.

Canada's lower chain penetration in the convenience outlet classes is consistent with buyer differences for convenience products and Canada's relative difficulty in achieving physical distribution economies and centralization economies. This would also explain why the United States has pushed further in chain-store penetration in the nonconvenience outlet classes most susceptible to these economies, and in nonconvenience classes where the effects of Canada's cultural diversity are more pronounced, such as style-sensitive clothing items.

Canada's lead in some of the other nonconvenience classes may reflect a number of factors. First, the greater geographic dispersion of the Canadian population may put greater emphasis on the general or department store than in the United States. (Unfortunately, all department stores were classified as chains in Canada, and no finer data is available to make the comparison between U.S. and Canadian department-store chains directly.) With general or department stores selling greater proportional volumes in Canada than in the United States, the motivations for chain penetration in these areas may be greater. This conclusion is supported by the data in Table 2.4, which compares the ratio of sales of matched retail outlets classes in Canada and the United States to total retail sales in two countries. Broad-line general stores have generally accounted for a greater percentage of total retail sales in Canada, especially relative to total non-food retail sales (which is important since the proportional retail sales of food in Canada are substantially higher than in the United States).

Table 2-4 Comparative Importance of Matched Retail Outlet Classes to Total Retailing Sector in Canada and the United States

Retail Outlet Class	% of Total Retail Sales 1954		% of Total Retail Sales 1958		% of Total Retail Sales 1963		% of Total Retail Sales 1967	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
Grocery	18.9	20.3	20.2	21.9	22.6	21.5	23.5	21.0
Other Food	1.3	1.3	7.3[1]	2.7	3.7	1.9	2.4	1.7
Drug	2.3	3.1	2.5	3.3	2.8	3.4	2.9	3.3
Department Stores	8.8	6.2	8.7	6.7	9.7	8.4	8.9	10.4
General Merchandise							2.8	1.9
Variety	1.9	1.8	2.0	1.8	2.3	1.9	2.2	1.7
Total Broad Line General Stores	10.7	8.0	10.7	8.5	12.0	10.3	13.9	14.0
Motor Vehicle	16.8	14.8	15.6	12.7	17.5	15.3	18.4	14.7
Gasoline Service Stations	5.2	6.3	6.7	7.1	9.3	7.3	8.3	7.3
Men's Clothing	1.7		1.5	1.3	1.6	1.2	1.5	1.1
Women's Clothing	1.8		1.7	2.3	1.9	2.2	2.0	2.0
Family Clothing	1.6		1.5	1.4	1.4	1.3	1.5	1.1
Shoes	1.0	1.1	1.0	1.1	1.2	1.0	1.2	0.9
Furniture, TV Appliance	1.6	3.2	3.7	2.4	3.4	2.2	3.3	2.1
Jewelry	1.0	0.8	0.9	0.8	0.9	0.6	0.9	0.7
Fuel	2.1	1.7	2.1	1.7	2.1	1.4	1.9	1.3

Sources: U.S. Bureau of the Census, Census of Business, Chapter 4, pp. 1-7 (1954), Chapter 4, pp. 1-32 (1958), Chapter 4, pp. 1-37 (1963), Chapter 4, pp. 9-33 (1967).

Dominion-Canadian Bureau of Statistics, Retail Trade 1954, p. 5-10,
Dominion-Canadian Bureau of Statistics, Retail Trade 1958, p. 8,
Dominion-Canadian Bureau of Statistics, Retial Trade 1961-64, pp. 6-9,
Dominion-Canadian Bureau of Statistics, Retail Trade: Revision to 1966-1970 Postcensul Estimates, July 1971, p. 16-18.

Second, similar reasoning could apply to hardware and building material stores. In a more rural, agriculturally oriented economy, these retail classes may have generally broader product lines and sell higher volumes of merchandise than do similar outlets in the United States, supporting their greater chain penetration in Canada. This conclusion is supported by our analysis of the relative sales size of retail establishments reported below as well as the observation by Moyer that Canadian lumber and building material and hardware stores were moving very aggressively into broader product lines.[12]

Third, data in Table 2.1 show that durable goods are a proportionally greater component of consumption expenditures in Canada than in the United States, and this is supported by the greater relative sales of furniture, TV and appliance stores in Canada than in the United States (Table 2.4). For the same reasons as we discussed above, this greater proportional volume could help explain the relatively greater chain-store penetration in Canada in these areas.

THE RELATIVE CONCENTRATION OF SALES IN THE LARGEST RETAIL FIRMS

While the penetration of all chains in retailing is generally less in Canada than in the United States, we had reason to suspect earlier that the concentration of sales in the very largest retail firms might be greater in Canada. This is confirmed by the data in Table 2.5, which gives the concentration of retail sales in the largest retail firms in Canada and the United States for selected years. The top-end concentration in retailing has increased steadily in the United States throughout the period 1955 through 1975, and in Canada for at least the measured 1972-1974 period. This trend is consistent with rising buyer income, education levels and mobility and other factors reducing the local orientation of the buyer and his demand for personal service from the retailer. Increasing population has increased the volume and variety of goods sold by retailers, enhancing the potential economies of chains. Improvements in the logistics infrastructure, in the ease and cost of communication, and in the ability to coordinate complex operations and to process information to manage them have improved distribution efficiencies. Urbanization of the population has played a similar role.

Analysis of the product lines of the largest retail firms revealed no substantial tendency towards diversification of operations to include operating in several classes of retail outlets. Thus the large retail firm has by and large taken increasing market shares of its retail outlet class. When viewed in the context of the experience in manufacturing industries then, concentration in retailing is rapidly becoming a question of importance for public policy. Since weighted average concentration ratios in manufacturing industries have not increased significantly since 1945, the relative power of the retail sector vis-à-vis manufacturing is generally increasing.

The share of retail sales accounted for by the top 10 and 20 retailers is substantially higher in Canada than it is in the United States. This conclusion is strengthened when the largest retailers in food and general merchandise are compared in the two countries. The 4 largest food chains in Canada account for over 60 per cent of food sales in 1975, while the 4 largest U.S. chains

Table 2-5 Comparative Concentration of Sales in the Largest Retail Firms in Canada and the United States

(Sales in Billions of Dollars)		1955	1958	1961	1964	1967	1970	1971	1972	1973	1974	1975
UNITED STATES												
Top 10	Sales	15,499	18,645	20,609	24,579	29,632	39,460	42,619	47,810	54,085	60,311	66,189
	% Total	.083	.093	.094	.094	.095	.105	.104	.107	.107	.112	.113
Top 20	Sales	20,019	24,224	27,511	32,773	40,418	53,347	57,887	64,567	72,993	82,320	89,586
	% Total	.108	.121	.125	.125	.129	.142	.142	1.44	.145	.153	.153
Top 25	Sales	21,635	26,293	29,856	35,650	44,117	58,297	63,330	70,861	79,841	89,777	97,170
	% Total	.117	.131	.136	.136	.141	.155	.155	.158	.159	.167	.166
Top 50	Sales	25,610	32,;12	37,262	45,139	54,961	73,572	80,439	89,895	100,494	111,587	121,682
	% Total	.138	.159	.170	.173	.175	.196	.197	.200	.200	.207	.208
Top 4 Food Retailers	Sales											24,181
	% Total											.188
Total Retail Sales		185,638	200,353	218,811	261,630	313,503	375,527	408,850	448,379	503,300	537,800	584,423
General Merchandise		20,103	21,669	24,907	32,350	42,174	61,320	68,134	74,903	83,300	89,300	95,402
Food Sales		43,638	50,263	55,421	62,864	72,137	86,114	89,239	95,020	105,700	119,800	131,723
CANADA												
Top 10	Sales								3,440	10,169	12,574	
	% Total								.249	.266	.286	
Top 20	Sales								10,082	13,102	15,855	
	% Total								.297	.342	.362	
Top 4 Food Retailers	Sales											8,114
	% Total											.631
Total Retail Sales		13,112	15,444	16,073	19,351	24,155	28,033	30,646	33,929	38,239	43,819	50,482
General Merchandise		1,930	2,285	2,532	3,057	3,941	4,829	5,310	6,003	6,847	7,930	9,160
Food Sales		3,379	4,246	4,298	5,074	6,264	7,483	7,914	8,608	9,617	11,223	12,867

Sources: Fortune, "The Fifty Largest Merchandising Firms," July

Canadian Business, "The 200 Largest Companies," July

U.S. Bureau of the Census, Retail Trade.

Dominion Bureau of Statistics, Retail Trade.

account for only 19 per cent. Evidence developed by Mallen[13] yields a similar conclusion in general merchandise, where the 4 largest Canadian department stores account for 21 per cent of department-store sales in 1970 compared to 11 per cent for the 4 largest U.S. chains (Sears-Roebuck, J.C. Penney, Montgomery Wards and Federated Department Stores).

While overall penetration of all chains is lower in most Canadian retail outlet classes, there is evidence that the penetration of the largest chains is greater in Canada in at least two important retail outlet classes. However, since chain-store economies are perhaps most significant in these two broad-line outlet classes, the large size of leading retailers in these outlet classes supports our earlier interpretation of the determinants of top-end retailing concentration. This data may be suggestive of a similar conclusion in other retail outlet classes as well. In addition to the factors discussed earlier, the greater top-end concentration in Canadian retailing may reflect in part a somewhat looser Canadian antitrust policy toward retail chains. While large U.S. chains have encountered antitrust limits, there is little evidence that similar constraints affect the large Canadian chains. Otherwise the regulation of retailing appears to be similar in Canada and the United States.[14]

When our finding of greater concentration in Canadian retailing is combined with the general impediments to chain-store development in Canada discussed in the previous section, it appears that there is a three-tiered structure in Canadian retailing. It consists of one group of a few very large chains who have reaped the economies of chain stores and perhaps pre-empted the favorable retailing locations and convenience-conscious consumers. The second group is a relatively larger number of small and medium sized chains, most probably operating in a single Canadian province or region within a province. The growth of these chains is constrained by the cultural diversity and other impediments to chain-store development described earlier. They operate in a single area to minimize these impediments. Finally, a large proportion of retailers are small independent outlets, emphasizing product lines tuned to the buyers in their particular areas and customer service.

CHAIN-STORE PENETRATION AND PRIVATE-LABEL MERCHANDISE

Private-label goods are those products sold under the retailer's brand name rather than the brand of the manufacturer who produced them. Their presence is a manifestation of retailer power.[15] The manufacturer gives up identification with the product and the power over the retailer this yields because of the retailer's control of a large volume of sales of the product. Depending on the nature of the product, chain stores may be a prerequisite for private-label merchandise. In convenience goods where the retailer has little influence over the sale of the product, the private-label product must generally be sold at a lower price to compete successfully against manufacturer-branded and promoted goods; to be able to sell at a lower price, the retailer generally must be a large chain retailer able to purchase goods in large quantities. In nonconvenience goods, however, though the presence

of chains will encourage the development of private-label goods, they are not a prerequisite. This is because the retailer has strong influence over the sale of the product, and the retailer's brand is consequently able to compete quite successfully with manufacturers' brands even in the absence of a price differential.

Manufacturing technology also has a role in private-label selling. The economies of scale in producing a given product dictate what level of retailer sales volume for that product is necessary to compete successfully in private label. Where manufacturer concentration is high and leading manufacturers all sell their own brands, the presence of economies of scale in manufacturing (which is likely) means that the chances for a private-label product selling at a competitive price differential depend on the presence of very large retail chains. Where economies of scale in manufacturing are less important, large chains may not be so necessary to support a private label.

While no systematic data were available to support such a conclusion, a number of observers have suggested that private-label goods are significantly less important in Canada than in the United States. This is clearly consistent with the lower overall penetration of chains in Canada, but not with the greater top-end concentration in Canadian retailing. The question is why have the large Canadian chains not adopted private label faster?

A number of further characteristics of the Canadian economy have a bearing on private-label usage and may address this question. First, larger imports, which tend to be in differentiated products (as will be discussed elsewhere in this study), tend to work against private label in Canada. If these are manufactured subject to economies of scale abroad, the chances that Canadian manufacturers can match production efficiencies to yield a discount price for private-label merchandise are reduced. Second, while top-end concentration in retailing is greater in Canada, so is concentration in manufacturing, as we will also discuss elsewhere in this study; moreover we will also find that much Canadian manufacturing may be at inefficiently small scale due to the relatively small size of the Canadian economy. The combination of these two factors means that it may be difficult for the Canadian chain retailer to secure efficient production of private-label merchandise to compete with the leading manufacturers' brands.

THE SIZE OF RETAIL ESTABLISHMENTS IN CANADA AND THE UNITED STATES

In view of the smaller size of the Canadian economy and the difference in the penetration of chain stores in retailing, it is of interest to compare the size of retail establishments (or individual retail locations) in the two countries as measured by sales. The importance of this issue is reinforced by our conclusion elsewhere in this study that Canadian manufacturing plants operate at an inefficiently small scale relative to the United States. Tables 2.6 and 2.7 present data on the sales of retail establishments in a variety of matched Canadian and U.S. retail outlet classes. As in Table 2.3, the differences between the Canadian and U.S. census years preclude comparisons of exactly matched years in all classes. Since retail sales have increased

Table 2-6 Comparative Size of Establishments by Matched Retail Outlet Class in Canada and the United States

Type of Retail Outlet (figure in thousands of dollars)	1951 Can. Single	1951 Can. Small-Multi	1951 Can. Chain	1954 U.S. Single	1954 U.S. Small-Multi	1954 U.S. Chain
Total - All Stores	[illegible]	107.9	219.4	[illegible]	[illegible]	383.3
Bakery Products	[illegible]	[illegible]	36.6	[illegible]	65.5	75.2
Candy, Nut, & Confectionery Stores	[illegible]	27.5	26.8	[illegible]	38.0	65.1
Grocery Stores	[illegible]	102.5	[illegible]	[illegible]	299.3	782.1
Meat & Fish Markets				[illegible]	[illegible]	203.0
Meat Markets	[illegible]	99.9	[illegible]			
Fish Markets	[illegible]	48.8	21.8			
Eating Places	[illegible]	63.5	99.3	40.1	[illegible]	134.6
General Merchandise	[illegible]	68.4	[illegible]	[illegible]	[illegible]	332.5
General Stores	[illegible]	101.0	93.1			
Variety Stores	[illegible]	80.9	[illegible]	[illegible]	67.9	320.7
Automobile Dealers - New	[illegible]	[illegible]	[illegible]	[illegible]	663.8	1,427.6
Used Car Dealers	[illegible]	179.7	[illegible]	[illegible]		253.0
Accessories, Tire, Battery Stores	[illegible]	156.3	291.8	71.3	120.2	202.8
Service Stations	[illegible]	92.4	67.7	54.9	107.5	138.0
Men's and Boy's Clothing Stores	[illegible]	[illegible]	[illegible]			
Women's & Misses' Ready to Wear	[illegible]	60.9	92.6			
Millinery Stores	[illegible]	31.9	[illegible]			
Lingerie & Hoisery Stores						
Children's & Infants Wear	[illegible]	38.2	88.1			
Family Clothing Stores	[illegible]	110.6	[illegible]			
Shoe Stores				[illegible]	90.7	[illegible]
Men's Shoes	[illegible]	57.8	[illegible]			
Women's Shoes	[illegible]	104.1	44.9			
Family Shoes	[illegible]	[illegible]	62.5			
Lumber & Building Materials	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	194.6
Plumbing, Electrical, Paint, Glass and Wallpaper				61.0	105.1	116.9
Plumbing & Electrical Stores	[illegible]	[illegible]	79.8			
Paint, Glass, Wallpaper Stores	[illegible]	64.8	[illegible]			
Hardware Stores	[illegible]	108.6	[illegible]	67.6	[illegible]	294.1
Household Appliance Stores						
Furniture Stores	[illegible]	[illegible]	[illegible]			
Drug Stores	[illegible]	[illegible]	90.4	[illegible]	[illegible]	300.7
Opticians	[illegible]	[illegible]	[illegible]			
Fuel Dealers			303.9	91.9	[illegible]	[illegible]
Farm Implement Dealers	[illegible]	[illegible]	191.2	143.2	[illegible]	593.3
Florists	[illegible]	41.5	[illegible]	29.4	[illegible]	67.3
Luggage & Leather Goods Stores	[illegible]	43.6	[illegible]			
Tobacco Stores & Stands	[illegible]	64.9	80.6	35.3	[illegible]	61.8
News Dealers	[illegible]	138.9	[illegible]	[illegible]	[illegible]	[illegible]
Gift, Novelty & Souvenir Shops	38.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jewelry Stores	[illegible]	54.4	353.4	48.9	[illegible]	195.6
Sporting Goods			[illegible]			

Type of Retail Outlet (figure in thousands of dollars)	1961 Can. Single	1961 Can. Small-Multi	1961 Can. Chain	1963 U.S. Single	1963 U.S. Small-Multi	1963 U.S. Chain	1966 Can. Single	1966 Can. Small-Multi	1966 Can. Chain	1967 U.S. Single	1967 U.S. Small-Multi	1967 U. S. Chain
Total - All Stores	75.0	148.6	466.3	104.0	205.1	516.8	104.4	185.5	577.3	121.0	307.9	653.2
Bakery Products	[illegible]	37.7	49.1	[illegible]	[illegible]	[illegible]	35.1	45.1	54.0	65.5	77.6	83.8
Candy, Nut, & Confectionery Stores							22.3	44.8	37.8	32.7	51.0	59.8
Grocery Stores	61.1	313.1	1,042.9	94.1	467.0	1,176.1	101.6	459.7	1,134.0	137.1	[illegible]	1,245.0
Meat & Fish Markets												
Meat Markets	21.6	145.4	183.8	[illegible]	166.7	[illegible]						
Fish Markets												
Eating Places												
General Merchandise	[illegible]	299.5	308.9	[illegible]	187.8	476.5	142.1	287.2	551.2	155.0	324.7	509.7
General Stores												
Variety Stores	59.2	78.5	364.6	66.2	88.4	[illegible]	82.5	123.6	460.8	85.3	140.0	453.7
Automobile Dealers - New												
Used Car Dealers												
Accessories, Tire, Battery Stores	[illegible]	175.7	250.6	[illegible]	151.3	[illegible]	150.0	208.2	295.7	[illegible]	201.9	302.5
Service Stations							86.4	143.7	[illegible]	98.3	139.9	169.5
Men's and Boy's Clothing Stores	63.5	104.6	117.6	[illegible]	[illegible]	317.3	91.0	151.2	[illegible]	[illegible]	241.2	422.3
Women's & Misses' Ready to Wear	[illegible]	101.0	126.6	[illegible]	179.9	[illegible]	75.5	137.1	[illegible]	109.2	265.4	406.5
Millinery Stores												
Lingerie & Hoisery Stores	24.4	52.0										
Children's & Infants Wear												
Family Clothing Stores	68.7	122.2	269.6	[illegible]	226.2	[illegible]	100.0	195.6	410.8	164.6	369.9	499.2
Shoe Stores	[illegible]	88.9	80.8	[illegible]	94.1	[illegible]	59.0	97.0	96.7	108.8	130.9	174.2
Men's Shoes												
Women's Shoes												
Family Shoes												
Lumber & Building Materials												
Plumbing, Electrical, Paint, Glass and Wallpaper												
Plumbing & Electrical Stores												
Paint, Glass, Wallpaper Stores												
Hardware Stores	62.8	110.9	268.6	[illegible]	164.7	[illegible]	[illegible]	173.3	418.4	94.6	195.3	322.1
Household Appliance Stores	85.0	179.5	107.5	107.2	[illegible]	131.7						
Furniture Stores	115.8	205.2	254.1	[illegible]	222.3	478.0	159.4	242.3	317.5	161.1	325.9	634.3
Drug Stores	[illegible]	112.3	140.3	[illegible]	166.3	[illegible]						
Opticians												
Fuel Dealers												
Farm Implement Dealers												
Florists												
Luggage & Leather Goods Stores												
Tobacco Stores & Stands												
News Dealers												
Gift, Novelty & Souvenir Shops												
Jewelry Stores							[illegible]	110.8	319.4	73.7	211.2	243.9
Sporting Goods												

Sources: Dominion Bureau of Statistics, Ninth Census of Canada - 1951, Volume VII, Disbribution, Table 13.

Dominion Bureau of Statistics, 1961 Census of Canada, Volume VI, Retail Trade, Table 10.

Dominion Bureau of Statistics, 1966 Census of Canada, Volume VI, Retail Trade, Table 11.

Table 2-7 Comparative Size of Establishments in Matched Retail Outlet Classes: 1971 - 1972

Retail Outlet	Sales per Establishment in Canada 1971 (thousands)	Sales per Establishment in the United States 1972 (thousands)
Bakery	45.5	82.5
Candy & Nut	41.7	50.7
Dairy	77.8	140.1
Fruit & Vegetable	81.9	78.0
Grocery Stores	293.9	471.2
Meat	130.4	230.7
Fish	77.2	153.9
Department Stores	5492.4	6589.2
General Merchandise	526.7	242.9
Variety	255.9	332.3
New Car	1399.7	2219.6
Used Car	199.0	134.3
Tire, Battery Accessory	179.7	240.3
Home & Auto Supply	611.9	252.5
Service Stations	132.7	138.6
Men's & Boys' Clothing	138.4	233.9
Millinery	17.8	74.8
Fur	104.6	97.2

Table 2-7 cont.

Retail Outlet	Sales per Establishment in Canada 1971 (thousands)		Sales per Establishment in the United States 1972 (thousands)	
Children's & Infants' Wear	67.9		105.3	
Family Clothing	181.8		261.3	
Piece Goods	52.6		78.0	
Men's Shoes	57.1		167.5	
Women's Shoes	108.86		182.3	
Children's Shoes	75.26		121.8	
Family Shoes	96.0		162.3	
Hardware	127.4		145.1	
Paint, Glass, Wallpaper	91.74		166.6	
Household Appliances	125.3		183.6	
T.V., Radio, Hi-Fi	103.6		222.6	
Floor Covering	183.5		234.0	
Draperies	106.8		111.6	
Pharmacies	195,6		326.0	
Patent Medicine	132.3		196.6	
Gov't. Liquor	1072.8			
Brewer's Retail	582.7	929.4	225.9	(Liquor stores)
Wine	159.9			
Jewelry	89.7		119.7	
Tobacco	90.8		91.7	

Table 2-7 cont.

Retail Outlet	Sales per Establishment in Canada 1971 (thousands)		Sales per Establishment in the United States 1972 (thousands)
Book & Stationery	95.8		
News	81.6		122.6
Florists	52.9		63.0
Sporting Goods	95.9		107.9
Boats	189.8		349.1
Motorcycle	135.1		335.7
Gift & Souvenir	46.8		46.6
Cameras	135.1		158
Pianos	124.3	103.3	186.3
Music Stores	97.7		
Luggage & Leather	63.7		106.8

Source: Statistics Canada,

U.S. Bureau of the Census, 1972 Census of Retail Trade, "Establishment and Firm Size."

steadily over time, the average sales figures for retail outlets are much more sensitive to differences in years than those for the relative penetration of chain stores. Hence, in discussing these data we shall concentrate most heavily on the 1966-67 comparison where the match of years is closest.

U.S. retail establishments are indeed bigger than Canadian establishments in the overwhelming majority of retail outlet classes, and this conclusion holds both for the data broken out by chain and non-chain retailers in Table 2.6 and the overall data in Table 2.7. This result is consistent with the generally lower chain-store penetration in Canada, since chain stores foster larger, broader-line retail establishments to maximize their advantages from distribution efficiency. The result is also consistent with lower population density and consumer mobility in Canda, both of which shrink the size of the effective market for Canadian retail establishments relative to the United States. Finally, smaller establishments are a result of the lower Canadian income level and greater diversity of tastes, which lower the retail sales in the effective retail markets and work against higher volume outlets selling standardized product lines.

These differences in Canadian establishment size hold for the establishments of single stores, small chains and chains of 4 or more units. The larger sales volume per establishment in the United States appears to be particularly significant in clothing, shoe, and drug retailing. This may explain (though in part reflect) the fact that chain penetration in these areas is increasing faster in the United States than in Canada, and this result in the case of style-sensitive clothing and shoes supports the hypothesis of greater diversity of tastes in Canada.

As seen in Table 2.6, Canadian retail establishments are larger in tire, battery and accessory stores in both chain and independent firms, and Canadian chain stores of 4 units or more have larger establishments in general merchandise, variety stores, hardware stores, and tobacco and news dealers. These are all outlet classes where Canadian chain-store penetration is greater, and reflect the tendency for product line and establishment volume to expand as chains develop. In Table 2.7 which includes data for some retail classes not available in Table 2.6 the data show that Canadian establishments also prove to be larger in fur stores, gift and souvenir stores and home and auto supply stores. The first two may reflect climactic differences and differences in the distribution of tourist attractions respectively. The last result is consistent with the earlier finding that chain-store penetration in Canadian home supply outlets exceeds that in the United States.

As Canadian consumers become more mobile and as population concentration in urban areas increases, Canadian retail establishments seem likely to increase in size. Controlling for these factors, however, our data support the view that increased chain-store penetration in Canada would improve the sales productivity of retail establishments. Since the diversity of consumer tastes is one of the factors limiting chain-store penetration in Canada, this diversity in Canada's consumer population has its costs in the size of Canadian retail establishments.

CONCLUSIONS

The nature of the data have precluded statistical tests of the many hypotheses advanced in the study. Since many variables influencing retail structure could not be measured accurately, we have used observed partial association between variables predicted by our theory as an indication of the usefulness of that theory. Yet our findings confirm a general pattern of differences between Canadian and U.S. retailing, and a consistent set of explanations for many of these differences. Thus despite the fact that complete tests could not be performed, we have some confidence in the general pattern of results as an input to policymaking and also to the discussion in Chapter 3.

NOTES TO CHAPTER 2

1. Palmountain (1958), and Catena and Hess (1975), pp. 520-522.

2. See Porter (1976), for a more comprehensive discussion.

3. These two prototypes of retail outlets are an abstraction from the numerous types of retail outlets which occur in practice. See Porter (1976, Chap. 2) for a discussion of the differences in outlets within these broad categories.

4. See Holton (1962), and Porter (1976), for discussion of some of these conditions.

5. For analysis of the problem see Williamson (1975).

6. Other country specific non-economic factors such as political philosophy, legal restrictions, etc. may also significantly affect chain store penetration. Chain stores very often can be a politically sensitive issue since they usually displace large numbers of small individual proprietors. Our theoretical discussion will not treat these factors, since they are idiosyncratic to the individual country. See Note 1.

7. See Baker (1965) and Munn (1966).

8. See Mallen (1971); Thompson and Leighton (1973), p. 143, and Moyer, "Evolving Marketing Channels in Canada," in Thompson and Leighton (1973).

9. Forbes, "Some Managerial Implications of Canada's Unique Distribution System," in Thompson and Leighton (1973), pp. 150-151.

10. Classification differences for the reported outlets, though always relatively minor, were greatest for Candy, Nut and Confectionary Stores, Accessory Tire and Battery Stores, and Lumber and Building Materials Stores.

11. Moyer, *op. cit.*, p. 198.

12. *Ibid*.

13. Mallen, *op. cit.*

14. Wyckham, R.G., and M.D. Steward,"Canada," in Boddewyn and Hollander (1972), pp. 81-99.

15. See the study of vertical relations in consumer goods in Porter, *op. cit.*, Chaps. 2 and 3.

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CHAPTER 3

COMPARATIVE ADVERTISING BEHAVIOR IN CANADA AND THE UNITED STATES

M.E. Porter

Advertising as a manifestation of the large firm has been the subject of intense debate among students of social policy toward business. In a purely competitive economy, no firm has the incentive to advertise since products are undifferentiated and competitors numerous. Where firms command a significant share of the markets they sell in, however, even the undifferentiated firm can benefit from advertising. When this is combined with the pervasive differentiation of products in many industries, there is ample reason to expect the large amounts of advertising we actually observe in every industrialized free enterprise economy. Total outlays on advertising in Canada were estimated at $909 million in 1965, an increase of 128 per cent in the period 1954-65.[1] One estimate of total advertising expenditures in the United States for the same year put outlays at $15.3 billion.[2]

In view of the substantial resources expended on advertising, the examination of the nature and consequences of advertising in Canada takes on importance. This importance is heightened by the fact that advertising is a major source of product information used by consumers in their choice of goods, and thus has a central role in the matching of buyers and sellers; the nature of the information advertising transmits is not innocent of social implications. Moreover, there is substantial evidence from the United States and other countries that advertising may have a pivotal influence on market power, especially in consumer-goods industries. From the point of view of public policy, both these factors magnify the importance of advertising beyond the absolute dollar outlays involved.

This study will seek to examine the nature and consequences of advertising behavior in Canada in a number of ways. It will examine the advertising behavior of firms in matched Canadian and U.S. industries, with respect to both total advertising outlay as a percentage of sales and the mix of advertising media employed. We will focus primarily on the level of advertising spending and its media mix, with data limitations precluding the analyses of other aspects of marketing strategy such as product innovation, service, etc. In addition to providing an understanding of advertising behavior in Canadian firms, the comparative analysis of advertising outlays is an advance over previous research in allowing an improved understanding of the causes of advertising behavior in general. The analysis also provides some predictions of how policy changes in Canada might affect advertising behavior in Canadian industries, and predictions of the future patterns of advertising in Canadian consumer-good-manufacturing industries. In other chapters we will examine the effect of advertising on industry concentration and diversification.

RATES OF TOTAL ADVERTISING

IN MATCHED CANADIAN AND U.S. INDUSTRIES

We will first examine the ratios of total advertising to sales (*AS*) in Canada and the United States. The examination of *AS* has assumed prominence in the investigation of firm advertising behavior and its consequences. *AS* reflects the portion of the firm's total revenue that is allocated to advertising, or some measure of the significance of advertising in the firm's operations and its importance in the total cost of products. When analyzing the levels of *AS* in matched industries in Canada and the United States, we must begin by presenting a model of the determination of advertising levels by the firm. Such a model will yield guidance in understanding and explaining the differences in advertising rates we observe.

A. THE OPTIMAL LEVEL OF ADVERTISING OF THE FIRM

Despite a great deal of research on advertising, comprehensive models of its determinants are still in their infancy. A recent study[3] has proposed a general framework for the determination of advertising behavior, and we shall briefly summarize this framework here.

The optimal advertising level of the firm can usefully be viewed as the result of the equilibrating reactions of individual transactors in the markets for product information to the characteristics of the information markets they face, and the clearing of the market as a whole. The firm's decision to supply advertising is derived from the buyer's demand for information to help him make his choice among competing brands of the product. In the buyers' information equilibrium are determined the size and composition of his investment in gathering information about brands from the various sources available, including the advertising media. The determinants of information equilibria for buyers in the market are important inputs to the determination of the seller's outlay on advertising. The other input is the seller's cost of disseminating information messages (such as advertising) to buyers. The demand of the buyer for the information that the seller controls and his cost of disseminating messages jointly determine the partial equilibrium of information outlays for the individual seller. Finally, advertising outlays of individual sellers interact in the market, with the revenue productivity of one seller's outlays dependent on the outlays of competing sellers. In addition, patterns of mutual dependence recognition among sellers influence the degree to which advertising competition occurs. The market equilibrium of information outlays reflects the reconciliation in the market of individual sellers' advertising preferences.

Buyer Information Equilibrium

The buyer has access to numerous sources of product information; his own experience, salespersons, advice from friends, physical comparison of competing brands, independent technical information (for example, Consumer Reports), advertising in the various media, and so on. He invests in costly information to make the optimally informed choice of the brand of a product that best meets his needs. Each source provides information about differing sets of product attributes and involves differing acquisition costs to the

buyer in time and utility. Advertising is a particularly inexpensive source of product information because it comes embedded in media and involves small expenditure of time and money. The content of advertising messages is constrained somewhat by media characteristics (e.g., the printed page versus a moving television ad), and is jointly determined with the quantity of messages purchased by the firm. Despite the fact that the content of advertising messages is a topic of interest, we can only treat it indirectly here since data on advertising content is difficult to develop.

In addition to its content and cost, each information source is of different "quality", where perceived quality increases with the source's flexibility in adapting information to the buyer's particular preferences or needs, the expertness of the source with respect to the brand and the product, and the likelihood that the source's information is colored by objectives (economic or otherwise) that may conflict with the buyer's. Since an advertising message remains fixed regardless of its receivers and is controlled by the seller, advertising's low cost is balanced against its lower quality.

A product will possess a set of product attributes, and buyers can be viewed as giving a utility ranking to these attributes. This ranking of product attributes will vary across products (for example, taste is an important aspect of some products, for others it is unimportant). Similarly, the desire of the buyer to make an informed choice will vary across products. As products vary in cost and other utility-affecting attributes, the optimal investment in information designed to increase utility by selecting the best brand will, in general, change. Combining this with the differing costs of the various information sources and their differing capabilities in informing about particular product attributes, it is clear that not only the buyer's optimal outlay on information but also the portfolio of sources he selects will differ from product to product.

This analysis suggests that advertising will be most important where the buyer's willingness to expend resources in gathering information from more expensive, higher quality sources is low. This will be true for frequently purchased, low-priced products, where the risks of a poorly informed choice are modest and the low cost of the product does not justify large outlays on information-gathering.

Partial Equilibrium of Information Outlay for the Single Seller

The seller faces buyers who select their strategies for gathering information as outlined above. The buyer demands messages from the various sources; the seller controls some of these messages directly (advertising media), other indirectly (presentations by the independent retailer's salespersons), and others not at all. The cost of supplying or influencing messages to buyers varies by information source, as do the sources' efficiencies in placing their messages before potential buyers of the particular product. For example, the cost per message of a salesperson's presentation may be higher than the cost of a magazine advertisement per reader. But the salesperson makes this presentation only to carefully selected (or self-selected) potential buyers, while the magazine advertisement is placed before many

persons not planning to purchase the product at the time. Thus the number of messages placed before potential buyers per dollar of outlay on sales promotion varies among the media. Since the density of potential buyers, the frequency with which they are in the market, and the ease with which they can be identified, all vary among products, this efficiency ratio also varies among products for a given medium.

The prices of messages sent via the various information sources, including the advertising media, are central data in the firm's optimization process. If they could discriminate freely in price, the media could set prices to different advertisers to capture all the rents that the advertisers derive from the transmission of messages via the media. However, the media supply their services in markets that are to some degree competitive. This is reinforced since their production costs are highly fixed with the actual publication or broadcast, leading to strong pressures to cut prices to fill advertising space or air time. In addition, a given quantity of information service is priced the same to all advertisers, so that price discrimination does not eliminate the variation of information-source efficiencies among products. Another important issue in media pricing is whether or not competition among media eliminates their differing efficiencies to different advertisers. Given the diversity of advertisers' situations, this would require elaborate price discrimination, which we do not observe.

The responsiveness of buyers to messages from information sources and the cost per message to potential buyers jointly determine the seller's optimal outlay on that source assuming no reactions of competing firms. Equalization of marginal returns from outlays on each information source controlled or influenced by the seller characterizes his optimal portfolio of information, of which his outlay on advertising will be a major part.

Market Equilibrium

The presence of competing sellers can affect the revenue productivity of information outlays by the firm. Competing outlays may reduce the response of buyers to messages of the firm. In addition, recognition of mutual dependence in the market limits the extent to which sellers will bid up advertising outlays competitively. Mutual-dependence recognition may shift rivalry from price to nonprice forms such as advertising, for example. Thus the firm's choice of information portfolio as well as the level of outlays will be altered by the presence of competitors. Seller concentration and other structual determinants of oligopolistic rivalry will therefore influence the level of information outlays in a market.

B. VARIATION IN ADVERTISING ACROSS COUNTRIES

This three part model of advertising determination yields clear predictions for the causes of differences in advertising rates across countries. Just as variation in the components of the model across products in a given country leads to cross-product differences in advertising rates, variations of the components of the model across countries give rise to cross-country differences in advertising rates for a given industry. Cross-country differences in advertising rates in an industry will reflect differences in buyer behavior leading to differences in the amount of advertising information gathered by buyers, they will reflect

differences in the cost of supplying advertising messages to buyers, and they will reflect differences in the patterns of competitive rivalry in the market. Differences in any one of these areas is sufficient to lead to differences in observed advertising rates.

We shall first examine the nature of international variations in each of the model's components in general terms, and then briefly consider the specific differences between Canada and the United States. In the discussion of our statistical analysis we shall have a lot more to say about the Canadian and U.S. differences.

Cross-Country Differences in Buyer Behavior

Advertising is a relatively inexpensive source of information from the point of view of the buyer, since it is either provided free or is embedded in media that are subsidized by advertisers and whose content has value in and of itself. The time outlays required to observe consumer advertising messages are low, and the disutility of doing so is often also low. Yet advertising is a relatively biased source of information from the buyer's viewpoint since its content is controlled directly by the seller.

Shopping by the buyer for purposes of physical comparison of products and to gather information through sales presentations and demonstrations is, on the other hand, quite costly in time and money relative to advertising. However, data gathered through this information source tends to be more reliable. The buyer's comparison and testing of goods is objective data from the buyer's viewpoint, and information from the retailer is less biased since the retailer is usually independent of the seller and often stocks multiple brands of the same product. In addition, the retailer can provide information directly responsive to the buyer's needs and questions reflecting those needs, while advertising messages are the same for all buyers. Thus, from the buyer's viewpoint, information gathered through shopping tends to be better (albeit more expensive) information about products than information gained from advertising.

From country to country, virtually all the components of the buyer's information equilibrium can vary for a given product. As income levels rise, the utility cost of time spent in shopping increases and the desire to make an informed choice for given products decreases as they represent a smaller part of the buyer's budget. In a less developed country such as Nigeria, for example, very low income levels mean that goods are purchased in very small quantities, and every good is purchased only after considerable shopping and comparison to allay the risk aversion of buyers.[4] There is evidence that the perceived cost of time increases with education levels, reducing the propensity to shop, and the propensity to shop should also decrease as the percentage of females in the labor force increases. As the willingness to shop and the desire to make an informed choice decrease, we should observe increases in the rate of advertising by sellers.

Other demographic and cultural factors should affect advertising levels as well. The subjective cost of time spent in shopping or the risk aversion in purchase decisions may change with culture. Indeed, there is

evidence from the United States that some individuals are "shoppers" who shop to a disproportionate degree. In addition, countries with population dispersed in areas which are geographically (or economically) isolated may place greater faith in the local merchant than in manufacturers'advertising.

In Canada the factors underlying buyer behavior are very similar to those in the United States, perhaps more so than any other country. Despite the strong degree of similarity, however, a number of factors in Canada point to buyers' demand for less advertising information than in the United States. Canadian income levels are lower, education levels are lower, and there are proportionally fewer females in the labor force. More of the population is geographically isolated. Some studies have identified language and cultural differences implying less advertising as well. One study argues that the Canadian consumer is more cautious about buying because affluence is more recent, and that this reflects a more skeptical attitude towards advertising.[5] Mallen argues that Canada's ethnic groups have a slower rate of assimilation than those in the United States, with the consequence that there are more pockets of different language, heritage, philosophy, social structure and so on.[6] These differences would reduce the demand for advertising (with its mass message) vis-à-vis shopping and reliance on the local (ethnic) retailers. They would also reduce the number of nationally branded and advertised goods in favor of local, less advertised varieties.

International Differences in the

Cost of Supplying Advertising Messages

From country to country, the cost of supplying messages about a given product varies according to the geographic dispersion of population, the diversity of buyers, the ease of identifying and reaching only potential buyers of the particular product, the availability and cost of advertising media, and the size of leading firms. As the cost of supplying advertising messages to potential buyers increases the rational seller will purchase fewer messages (other things including the responsiveness of the buyer to these messages being constant). If the seller's derived demand for advertising messages is elastic, his aggregate outlay on advertising will be lower.

Geographic dispersion of population will tend to increase the cost of supplying messages, since for all but national media the seller must purchase space in increasing numbers of local media to reach all buyers. While media prices clearly reflect the number of households they reach, any fixed element in the cost of media is sufficient to generate this conclusion.

Other things being equal, the more diverse the preferences of buyers for a product the more numerous the advertising messages required to meet these buyers' information needs, or the lower the responsiveness of buyers to a common message. If the supply of different advertising messages involves fixed costs, the cost of achieving a given level of buyer responsiveness to advertising will increase with buyer diversity. Buyer diversity shifts comparative advantage in product information transmittal towards information

sources such as salespersons' presentations, which can be tailored to individual buyers. Thus the seller in market with diverse buyers will spend greater information resources persuading the retailer to support his product than he would in a market with more homogeneous preferences.

The ease of identifying and reaching only potential buyers determines the degree to which advertising messages purchased by sellers will be subject to leakage (that is, to falling on the deaf ears of media consumers who are not potential buyers of the product in that period). One measure of this ease in identification is the proportion of households in the economy who are consumers of the product. Nearly all Americans purchase automobiles, for example, while in a less developed economy only a small fraction of the population may buy them: yet the cost of reaching these few consumers may be much higher than the cost of beaming advertising across national media with low costs per message in the United States.

The state of the advertising media in a country also plays a central role. In a large developed economy like that of the United States there is a wide variety of specialized publications and other specialized media that reach relatively small but highly select elements of the buyer population. The proliferation of magazines for photography enthusiasts, apartment dwellers, gourmets, and so on, is truly staggering, and these media allow the seller access to direct advertising outlays for products with a select buyer group only to potential buyers. In less industrialized and/or smaller economies, such media may be much less prevalent, increasing the cost of reaching buyers of those products purchased through advertising by only a small portion of the buyer group.

Advertising media that are important in some countries may not even be available in others, or may be much less efficient as information transmittal mechanisms. To the extent that the unavailable media are those with low costs per message per household, the quantity of advertising messages purchased may be reduced. While most countries have television, for example, the number of television sets per household varies markedly among countries. In some countries television exists but is state-owned or controlled, and advertising on it is restricted or eliminated. Penetration of radio as well as the number and advertising policies of magazines and newspapers vary a great deal from country to country in response to literacy rates, government policies and other factors. National media such as network television and wide-circulation magazines which reach large segments of the population at low cost also differ in availability and price from country to country.

The importance of size of firm to international differences in advertising rates depends on the presence of economies of scale in supplying advertising messages. If these exist, the large firm supplying a greater total volume of messages will have a lower cost per message than will the smaller firm. The effect of relative size depends critically on the transferability of media economies of scale, however. If smaller firms are in a smaller country, there may be relatively fewer economies of national versus local media than are present in a country like the United States.

Thus the level and shape of the advertising cost function may vary from country to country, complicating the interpretation of the effect of relative size differences among firms on advertising behavior.

In Canada we see a great deal of similarity to the United States in the factors determining the cost of supplying advertising, especially when the comparison is viewed in contrast to those between the United States and the great majority of other countries. Once again, however, some differences are worth noting. The greater geographic dispersion of the Canadian population and its lower urbanization should increase the cost of supplying advertising messages in Canada relative to the United States. So should the greater diversity of buyer preferences. The smaller size of the Canadian economy may mean fewer specialized media than in the United States. It also means that Canadian industries have smaller leading firms less able to reap any advertising economies of scale. In addition as Table 2.1 illustrates, the number of television and radio sets in use per thousand of population is somewhat less in Canada than in the United States.

An offsetting factor to these tendencies toward lower Canadian advertising is the greater proportion of durable goods purchases per capita in Canada as compared to the United States. This may mean that proportionally more Canadians purchase durable goods per period, reducing the leakage of advertising information vis-à-vis other information sources for these goods; thus in comparing Canada with the United States, we may see relatively more advertising on these goods than on other goods.

International Differences in

Pattern of Market Rivalry

Two dimensions of market rivalry are of particular importance when viewing international differences in advertising. First, for a given product, the patterns of mutual-dependence recognition may change across countries according to factors such as industry concentration, the number of different sellers, and social policies (and industry norms) towards acceptable inter-firm collusion. Second, the bargaining relation between manufacturers of a product and the wholesalers and retailers who sell it may vary among countries with the nature of buyer behavior, extent of chain-store penetration, concentration in retailing, and so on.

As mutual dependence recognition increases, perhaps measured by increasing industry concentration, advertising rates should increase at least up to a point. The hypotheses underlying this relation are well known, though somewhat controversial, and involve the shift of interfirm competition from price to nonprice forms such as advertising as mutual-dependence recognition increases, increasing the benefits of advertising for individual firms in more concentrated industries.[7]

As discussed in Chapter 2, advertising holds the key to the bargaining relation between manufacturers and retailers in convenience goods, and is influential in nonconvenience goods as well. Thus as chain-store penetration increases in the retail channels selling a product, manufacturers will shift their selling efforts away from persuasion of the retailer with a

manufacturer's sales force towards advertising directly to the consumer. In addition, as consumers' incomes rise and their cost of shopping increases, the retailer becomes less and less influential in selling a product and manufacturer advertising should increase to build relative power to the retailer.

Of the three areas of international variation in the determinants of advertising, patterns of mutual dependence and retail structure should provide the greatest source of differences between Canada and the United States. We found in Chapter 2 that chain-store penetration was generally less in Canada, except in some nonconvenience outlet classes. This should tend to reduce advertising rates in Canada relative to the U.S. In addition, the levels of concentration in given industries differ substantially between the two countries, as does the importance of foreign competition.

C. STATISTICAL ANALYSIS OF COMPARATIVE CANADIAN AND U.S. ADVERTISING RATES

The aggregate advertising data already cited provide some evidence that advertising is proportionally less important in Canada than in the United States. In 1965, aggregate advertising in Canada amounted to 1.75% of GNP and 2.34% of manufacturers' shipments while it represented 2.25% of GNP and 3.16% of shipments in the United States.[8] To examine comparable advertising rates in Canada and the United States more closely, we assembled a sample of 46 matched industries for the two countries. This procedure controls for differences in the distribution of output between consumer and producer goods and among consumer-goods industries in the two economies. In addition, comparing advertising rates in matched industries controls quite well for the gross characteristics of buyer behavior, though some aspects of buyer behavior should vary between the two countries as we have discussed above.

The sample of industries was at approximately the 3-digit level of the Canadian Standard Industrial Classification or the IRS Minor level of aggregation in U.S. data. The construction of the sample, sources of data, definitions of variables used in the analysis, and some of the limitations of the data are described in detail in Appendix B. Of the 46 industries, 15 were producer goods industries and 31 were consumer goods industries, of which 15 were convenience goods and 16 were nonconvenience goods. In the statistical tests reported below, the comparative analysis of advertising behavior was carried out on these subgroups of industries as well as on the sample as a whole.

The variables used in the study were as follows:

- USAS — Ratio of industry advertising to industry sales in the U.S. industry, 1965
- CAS — Ratio of industry advertising to industry sales in the Canadian industry, 1965
- RAS — Ratio of CAS to USAS
- CCR4 — Four-firm concentration ratio in the Canadian industry, 1965

CCR8	Eight-firm concentration ratio in the Canadian industry, 1965
USCR4	Four-firm concentration ratio in the U.S. industry, 1963
USCR8	Eight-firm concentration ratio in the U.S. industry, 1963
RCONC	Ratio of CCR4 to USCR4
RCONC8	Ratio of CCR8 to USCR8
EFT	Rate of effective tariff protection in the Canadian industry, 1963
IMP	Imports as a percentage of shipments in the Canadian industry, 1961
EXP	Net exports as a percentage of shipments in the Canadian industry, 1961
FSE	Sales by enterprises 50% or more foreign-controlled divided by industry sales in the Canadian industry, 1967
CSIZ	Average value of shipments for the leading four firms in the Canadian industry, 1965
USIZ	Average value of shipments for the leading four firms in the U.S. industry, 1965
RSIZ	Ratio of CSIZ to USIZ
CGROW	Ratio of 1965 value of shipments to 1958 value of shipments in the Canadian industry
UGROW	Ratio of 1965 value of shipments to 1958 value of shipments in the U.S. industry
RGROW	Ratio of CGROW to UGROW

1. BIVARIATE ANALYSIS OF COMPARATIVE ADVERTISING RATES

The incidence of advertising in both Canadian and U.S. industries follows the predictions of our model of advertising determination by firms. As shown in Table 3.3 (page 64) mean advertising rates are by far the highest in convenience good industries, where the consumer's demand for advertising information is the greatest and where average concentration ratios tended to be the highest. It is lowest in producer goods where advertising should play a minor part in buyer choice. It takes on an intermediate value in non-convenience goods, where advertising information is combined with shopping and information gathered from other sources to reach purchase decisions.

We shall first examine the bivariate relation between advertising to sales ratios in matched industries in the two countries. Table 3.1 presents simple correlations between CAS and USAS for the entire sample of matched industries and the various subsamples. The correlations are extremely high and highly significant, ranging from .82 to .98. The high correlation between advertising rates in the two countries supports the view that buyer behavior is the dominant influence on observed advertising levels, since we suspect buyer behavior to be relatively similar in the two countries and we know that industry concentation and retail structure differ between Canada and the United States, as do factors affecting the supply cost of messages such as firm size, buyer diversity and dispersion.

Table 3-1: Simple Correlation of Canadian Advertising to Sales Ratios and United States Advertising To Sales Ratios in Matched Industries, 1965

Full Sample	.969
Consumer Goods	.964
Producer Goods	.817
Convenience Goods	.971
Non-Convenience Goods	.874

The only known previous international comparison of advertising rates was N. Kaldor's and R. Silverman's comparison of U.S. and U.K. advertising rates for the year 1935.[9] Using data they compiled and matching it to an earlier study by Borden,[10] they found a correlation of .93 between advertising rates in a sample of 18 matched consumer-goods industries. This is quite consistent with our results, whose higher correlation is reinforced in view of the greater number of industries in our study.[11]

We were able to roughly match 13 of Kaldor's and Silverman's industries to the matched Canadian and U.S. industries in our sample. Table 3.2 presents an analysis of the relationships between the 1935 data and our data for 1965. While mean advertising rates have fallen substantially (and proportionally across industries), the correlation among advertising rates across the 30 year period is remarkably high.[12] This again supports the importance of the underlying characteristics of buyer behavior for products in determining advertising rates.

Table 3.3 presents means and standard deviations of CAS, USAS, and RAS. The mean value of RAS is always less than 1 except for nonconvenience goods, where it is greater than 1. Generally, then, advertising rates in Canadian industries are less than those in the United States, as was predicted earlier. The mean ratio is lowest in convenience goods, where Canadian chain-store penetration is behind that of the United States and where the higher durable-goods purchases of Canadian consumers would show up. These relationships are consistent with the theory of advertising determination presented above.

Table 3.4 presents regressions of CAS on USAS and $(USAS)^2$. In the regressions of CAS on USAS alone, the intercepts are negative and nearly significantly different from zero in the full sample, consumer goods, and convenience goods. The intercept is negative but not significant in nonconvenience goods, not surprisingly given the mean RAS of 1.07 in that subsample. In the full sample, consumer goods and convenience goods, the coefficient of USAS is greater than 1. This means that Canadian advertising rates begin lower but increase proportionally to U.S. advertising as the U.S. advertising rate increase. The coefficient of USAS in producer goods is less than 1, and different from 1 with a t-value of approximately 1. With the intercept not significantly different from zero, this suggests that CAS is increasing less than USAS as USAS increases in producer goods, which is supported by the mean value of .945 for RAS in producer goods. In nonconvenience goods, the coefficient of USAS is greater than 1, though not significantly. With a zero intercept, this provides some indication that CAS increases proportionately with USAS in nonconvenience goods, though it is higher, as shown by the analysis of means.

When $(USAS)^2$ is introduced into the equation to test for the presence of nonlinearities, the intercept terms become generally insignificant except for nonconvenience goods, where the intercept is positive and nearly significant. The coefficients of USAS fall markedly in producer goods and nonconvenience goods, but, while the coefficient of the squared term is insignificant in producer goods, supporting the earlier conclusion that Canadian advertising rates fall less than proportionately to U.S. rates in those industries, it is positive and significant in nonconvenience goods. Thus

Table 3-2 Relationships Among Advertising Rates in 1935 and 1965 for Selected Matched Consumer Good Industries

Means	Mean Ratio of Advertising To Sales	Standard Deviation
U.K. 1935	9.1	10.2
U.S. 1935	10.0	9.8
U. S. 1965	5.0	3.7
Canada 1965	5.3	4.3

Correlations Among Advertising Rates	U.K. 1935	U.S. 1935	U.S. 1965	Canada 1965
U.K. 1935		.93	.68	.65
U.S. 1935			.77	.79
U.S. 1965				.97

Regression

	Intercept	USAS 1965	Corrected R^2
USAS 1935	-.6057 (.019)	2.0059 (4.003)	.56

Table 3-3: Means and Standard Deviations for Selected Canadian, United States and Comparative Industry Variables

Variable	Full Sample (n=46)		Consumer Goods (n=31)		Producer Goods (n=15)		Convenience Goods (n=15)		Non-Convenience Goods (n=16)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
CAS	2.53%	3.12%	3.43%	3.45%	.69%	.46%	4.89%	4.23%	2.06%	1.56%
USAS	2.50%	2.77%	3.34%	3.01%	.75%	.45%	4.85%	3.56%		
RAS	.972	.423	.985	.375	.945	.508	.890	.312	1.07	.406
CCR4	49.3%	23.6%	49.2%	24.4%	49.7%	21.9%	55.9%	23.6%	42.8%	23.3%
USCR4	38.0%	16.8%	39.0%	17.6%	35.9%	14.9%	40.7%	15.1%	37.4%	19.6%
CCR8	63.7%	25.7%	63.8%	26.6%	63.5%	23.7%	70.3%	22.9%	57.8%	28.3%
USCR8	50.3%	19.4%	51.6%	20.3%	47.8%	17.3%	54.1%	18.1%	49.2%	21.9%
RCONC	1.32	.49	1.28	.47	1.42	.50	1.39	.47	1.17	.46
RCONC8	1.28	.34	1.24	.33	1.36	.36	1.32	.26	1.17	.37
CGROW	1.61	41	1.58	.45	1.69	.30	1.41	.20	1.74	.56
UGROW	1.43	.29	1.39	.26	1.50	.33	1.33	.26	1.45	.24
RGROW	1.14	.23	1.14	.23	1.16	.23	1.08	.17	1.19	.26
RSIZ	.108	.063	.098	.043	.129	.087	.115	.045	.081	.034

Table 3-4: Regression Equations Explaining Absolute Advertising to Sales Ratios in Canadian Industries

Sample (units of advertising are percentages)	Intercept	USAS	$(USAS)^2$	R^2	Corrected R^2
1.Full Sample	-.200 (1.271)	1.0941[a] (25.90)		.938[a]	.937
2.	-.002786 (.013)	.92928[a] (7.196)	.0001547 (1.349)	.941[a]	.938
3.Producer Goods	.159 (.564)	.58781 (.917)	.001146 (.389)	.672[a]	.618
4.	.0654 (.460)	.82855[a] (5.116)		.668[a]	.647
5.Consumer Goods	-.2712 (1.061)	1.1060[a] (19.485)		.929[a]	.927
6.	.006940 (.018)	.93063[a] (4.861)	.0001524 (.959)	.931[a]	.926
7.Convenience Goods	-.7012 (1.477)	1.1525[a] (14.617)		.943[a]	.938
8.	-.3887 (.521)	.99398 (3.338)	.0001261 (.553)	.944[a]	.935
9.Non-Convenience Goods	-.0854 (.226)	1.1089[a] (6.726)		.764[a]	.727
10.	1.035 (1.323)	-.03787 (.052)	.002089[c] (1.610)	.803[a]	.773

Note: Figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the F test.

[a]Indicates coefficient is significant at the 99 percent level.

[c]Indicates coefficient is significant at the 90 percent level.

in nonconvenience goods CAS increases more than proportionally to USAS as USAS increases. In convenience goods and consumer goods generally, the coefficient of USAS falls below 1 (though not significantly so) and the squared terms are not significant either.

Generally, then, without control for any inter-country differences along other dimensions, Canadian advertising rates tend to be lower in the full sample, consumer goods, producer goods, and convenience goods, while they tend to be higher in nonconvenience goods. This confirms our general prediction that Canadian advertising rates would be lower because of buyer and message-cost factors. There is little evidence that these differences are due to the so-called spillover of U.S. advertising into Canada, since the spillover problems would imply consistently lower Canadian advertising in all industries and for all levels of advertising.

2. MULTIPLE REGRESSION ANALYSIS OF CANADIAN AND U.S. ADVERTISING RATES

To explain the ratio of Canadian to U.S. advertising rates more fully, we conducted a multiple regression analysis. The bivariate analysis suggested that the underlying buyer-choice processes for matched industries were quite similar in the two countries, in view of the high values of explained variance in the bivariate models. When testing across the two countries, the primary sources of a variation in advertising rates should be differences in competitive rivalry in the matched industries, and differences in the size of firms and other determinants of the supply cost of advertising messages.

In controlling for differences in market rivalry in the two countries, differences in concentration ratios provide the appropriate starting point. Our research design using matched industries from both countries will allow us to perform a relatively pure test of the relation between advertising and concentration. Previous work which examines the relation between inter-industry variances in advertising and concentration in a given country has been plagued by the inability to control for the myriad of determinants of the underlying buyer-choice process. Since this process appears to be the dominant influence on advertising behavior, the advertising-concentration relation has not been clearly visible. In examining the ratio of Canadian to U.S. advertising for matched industries, we control for the most important elements of the buyer choice process and any advertising-concentration relation should appear.

However, in a small open economy such as Canada's, the Canadian industry concentration ratio is an incomplete measure of the patterns of rivalry in the industry. In such an economy, rivalry should be strongly influenced by exposure to foreign trade. Thus market rivalry should be inversely related to the rate of effective tariff protection in the market, and positively related to the extent of import competition. The other dimension of international trade, exports, has a more complex impact on market rivalry in the home country. If the country's home market is assumed to be uninsulated from competition for imports, then high exports should signal the presence of a world market with correspondingly greater rivalry than recorded by the home country's concentration ratio. If the home market is

assumed to be protected by tariffs or transportation costs, however, high exports signal the opportunity for profitable price discrimination, and an outlet for competitive behavior which does not destabilize the home market. Evidence for this latter view is found in a recent paper which finds that the presence of exports tend to stabilize market shares among leading firms.[13]

Exports raise a further problem for our analysis of comparative advertising behavior, however. While the advertising ratios for Canadian industries included internal costs of advertising outside Canada of Canadian firms, they do not appear to include the media cost of advertising outside Canada. Thus for industries with heavy exports, the measured advertising ratios are biased downward. A negative association between relative advertising and Canadian exports, then, could reflect this mismeasurement rather than any behavioral relation. The potential mismeasurement suggests that exports should be included in the analysis of relative advertising as a control variable at the very least. We assumed that the effect of foreign trade was much less significant to rivalry in U.S. industries, and thus U.S. trade variables are not included in the model.

In addition to the measures of market rivalry, we developed comparative Canadian-U.S. measures of some additional determinants of advertising behavior. Relative size in sales of the leading four firms in the matched industries should control for economies of scale in advertising that apply to both Canada and the United States. Since leading firms in Canadian industries are in every case substantially smaller than their U.S. counterparts (Table 3.3), the relative size effect would produce a shift in the mean value of <u>RAS</u>. Whether or not the variation in relative size we observe across matched industries (from .02 to .33, with most values near the mean of .11) should lead to variation in <u>RAS</u> depends on the shape of the advertising cost function. Even if our basic hypothesis about the effect of size differences on advertising is correct, the observed variation of relative sizes could occur in a range where the advertising cost function is relatively flat and thus the regression coefficient of relative size may not be statistically significant. In addition, the hypothesis depends critically on there being economies of scale in advertising that apply to both countries. Given the smaller Canadian market, economies of scale in national media may be less pronounced in Canada as our analysis of media differences below will support.

Two more variables were included in the analysis. One was a measure of the relative nominal rates of growth in the Canadian and U.S. matched industries over the period 1958-65. Previous research has found that advertising rates increase as markets mature,[14] and differences in Canadian and U.S. growth rates for an industry could mean that the two countries are at different points in the life cycle of a given industry. In addition, rapid growth could be associated with less market rivalry.[15] As shown in Table 3.3, Canadian industries generally grew faster than their U.S. counterparts. This is consistent with Canada's faster rate of population growth and faster growth in disposable income (Table 2.1, page 31), and such causes may not reflect life cycle or rivalry differences.

A final variable introduced into the analysis was the proportion of output in the Canadian industry accounted for by foreign controlled firms. Foreign controlled firms with preferences and objective functions different from those of Canadian national firms could increase industry rivalry, or they could bring to the market marketing preferences different from those of Canadian firms.[16] In addition, including this variable in the analysis provided one possible mechanism to measure the spillover effect of advertising by firms in border areas of the United States, advertising that also reaches consumers in the Canadian market. Since Canadian firms not operating in the United States would not have sales to the border U.S. market over which to amortize their advertising outlays, their advertising costs for achieving given message volumes to Canadian consumers would be higher than those of firms operating in both countries. Since advertisers taking advantage of spillovers would have lower advertising costs per message per Canadian household, other things being equal they would purchase more advertising messages than would Canadian firms. (The effect on the outlays depends on elasticity of demand for messages as described above.) The key to how this would affect relative Canadian-U.S. advertising in a given industry would depend on where firms did this additional advertising. If the additional outlays were spent through the firm's Canadian subsidiaries on Canadian media, the ratio of Canadian to U.S. advertising would increase. If firms did additional advertising in the U.S. border media, advertising on Canadian media by their subsidiaries might even decrease. Since the proportion of foreign-controlled firms in U.S. industries is quite small, the lack of a corresponding figure for the matched U.S. industries was not believed to affect the results.

Statistical Results

Table 3.3 presented means and standard deviations of the variables included in the analysis for the full sample and subsamples; Table 3.5 gives simple correlations between selected independent variables and RAS. Concentration is generally higher in Canada than in the United States, growth in shipments is also higher, and the average size of leading firms is greatly lower. As is the case in the United States, Canadian concentration tends to be higher in convenience goods than in nonconvenience goods, perhaps reflecting the potent role of advertising as an entry barrier in convenience goods.

Mean RSIZ is lowest for nonconvenience goods, which also have the highest mean RAS, which provides some limited support for the view that small relative size leads to advertising disadvantages. While RSIZ is generally quite collinear with RCONC, it is significant to note that for nonconvenience goods RCONC takes on the lowest mean value of any subsample. Thus the association between high mean RAS and low mean RSIZ does not appear to reflect the collinearity of RSIZ with high relative concentration, which we expect also to drive up RAS.

The correlations in Table 3.5 generally confirm our basic hypotheses, but reveal some rather sharp differences among subsamples. Relative concentration increases RAS, and this correlation increases as nonlinear specifications of relative concentration are tested as described below. Except for convenience goods, imports (IMP) are always negatively related to RAS

Table 3-5: Correlations Between Relative Advertising Rates and Comparative Industry Structural Variables

	RAS				
	Full Sample	Consumer Goods	Producer Goods	Convenience Goods	Non-Convenience Goods
RCONC	.35	.21	.57	.16	.39
RCONC8	.34	.28	.45	.25	.41
IMP	-.08	-.01	-.20	.08	-.21
EXP	-.13	-.03	-.42	-.05	-.07
EFT	-.00	.23	-.51	.44	.02
FSE	.20	.43	-.17	.39	.44
RSIZ	.27	-.08	.58	-.05	.09
RGROW	.07	.08	.05	-.08	.08

supporting either mismeasurement of Canadian advertising rates in high export industries or the hypothesis that exports signal greater rivalry than indicated by measured concentration. The effective rate of tariff protection (EFT) is positively related to RAS except for producer goods, which supports the view that high tariff protection reduces effective competition and raises advertising. Foreign subsidiary share (FSE) is positively related to RAS except in producer goods industries, supporting, either the hypothesis that foreign subsidiaries increase advertising rivalry or one version of the spillover hypothesis. Relative size (RSIZ) is erratic, though not strongly associated with RAS except in producer goods. Relative growth (RGROW) is not strongly associated with RAS anywhere, though its sign is generally perversely positive.

One striking difference among the subsamples is the clear ranking in terms of the association of RAS with RCONC and RCONC8. Relative concentration explains a higher proportion of relative advertising in producer goods and nonconvenience goods than it does in convenience goods. But this is not surprising. In producer goods, advertising is generally a relatively unimportant element of marketing strategy, reflected in the low mean levels of CAS and USAS in producer goods. Thus advertising rates are less sensitive to variations in buyer behavior and message supply costs, and more sensitive to competitive factors affecting nonprice competition such as concentration. The same reasoning holds to a lesser degree for nonconvenience goods. Relative to convenience goods, advertising is a less central element of marketing strategy in nonconvenience goods and inter-country variations in buyer behavior would affect it relatively less. These propositions are consistently supported in the regression results below, where we shall also discuss other differences among the subsamples.

(i) Full Sample

Table 3.6 presents multiple regression equations explaining RAS in the full sample of 46 matched industries. RCONC and RCONC8 are positive and always highly significant in all runs, with RCONC yielding somewhat better results. FSE is positive and always highly significant, and EXP is negative and sometimes significant. A dummy variable registering when the industry was a producer or consumer good improves the fit of the model, its sign signifying that relative advertising is higher in consumer goods, other things held equal. The other variables were not significant for the sample as a whole, but become significant when the differences among the subsamples are accounted for.

We constructed two additional classes of specifications for the relative concentration variable in an attempt to clarify the nature of the relationship. The first was a nonlinear specification of RCONC (and RCONC8) that assigned greater importance to high and low values of RCONC in determining RAS:

RCONC2	The value of RCONC raised to the second power
RCONC3	The value of RCONC raised to the third power
RCONC82	The value of RCONC8 raised to the second power
RCONC83	The value of RCONC8 raised to the third power

The nonlinear specifications of the relation between relative concentration and relative advertising performed generally better both in the full sample and in subsamples. Thus higher (greater than 1) values of relative concentration have a disproportionately positive influence on RAS, while low values have a disproportionately small influence. In the full sample, RCONC82 achieved the best statistical results.

Table 3-6 Multiple Regression Equations Explaining the Ratio of Canadian to United States Advertising Rates for 46 Matched Industries

	Intercept	RCONC	RCONC 8	ARCONC	EFT	FSE	EXP	RSIZ	CGPG	R^2	Corrected R^2
1.	.5720[a] (3.299)	.30210[a] (2.457)								.121[b]	.101
2.	.4404[b] (1.911)		.41594[a] (2.387)							.115[b]	.095
3.	.7622[a] (7.818)	RCONC 2 .10540[a] (2.702)								.143[a]	.123
4.	.8366[a] (10.987)	RCONC 3 .04036[a] (2.794)								.151[a]	.131
5.	.3426 (1.491)	.34314[a] (2.750)			.0001486 (.403)	.0003363[b] (1.782)				.188[b]	.130
6.	.4057[b] (2.097)	.34812[a] (2.905)				.0003864 (2.074)[b]	-.0006011 (1.456)			.224[b]	.169
7.	.5978[a] (4.562)	RCONC 2 .12433[a] (3.275)				.0004296[b] (2.334)	-.0005610[c] (1.393)			.258[a]	.205
8.	.6707[a] (5.846)	RCONC 3 .04811[a] (3.415)				.0004510[a] (2.457)	-.0005138 (1.289)			.271[a]	.219
9.	.5898[a] (4.019)	RCONC 3 .04971[a] (3.491)				.0004632[a] (2.510)	-.0005306 (1.326)		.10692 (.887)	.284[a]	.215
10.	.7372[a] (7.545)			1.2021[a] (4.148)		.0004116[b] (2.394)	.0002806 (.732)			.339[a]	.292
11.	.6143[a] (4.725)			ARCONC 3 1.2906[a] (4.402)		.0004305[a] (2.526)	-.0002892 (.764)		.16203 (1.411)	.370[a]	.308

Note: figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the F test.

[a] Indicates coefficient is significant at the 99 percent level.
[b] Indicates coefficient is significant at the 95 percent level.
[c] Indicates coefficient is significant at the 90 percent level.

Another class of specifications recognized the possibility that imports properly affected the measured concentration ratio rather than having a separate influence, as is reflected by introducing imports as a separate variable. To adjust concentration for imports directly we constructed the following additional variables:

ARCONC The value of CCR4 divided by IMP, divided by USCR4

ARCONC8 The value of CCR8 divided by IMP, divided by USCR8

ARCONC82 The value of RCONC82 divided by IMP

ARCONC3 The value of RCONC3 divided by IMP

Imports, because they signal that measured Canadian concentration is overstated, should decrease effective relative concentration. The weight given to imports in reducing measured concentration is implicit in the specification. IMP and CCR4 (and CCR8) were both in units of percentages of industry shipments, and the implicit weight given IMP is greater with the linear specifications of relative concentration. Generally, these specifications differentiated most strongly between industries with some imports and industries with nearly none. Alternative specifications not reported did not materially affect the results.

In the full sample, ARCONC performed about the same as RCONC, but ARCONC3 performed significantly better than the best unadjusted specification of relative concentration (RCONC3), with its t-value improving from 3.4 to 4.4 in the best equation, and corrected $\bar{R}^2$ increasing from .215 to .308. This result supports the view that imports increase effective competition and thereby have a negative influence on advertising.

(ii) Consumer Goods Industries

Table 3.7 presents multiple regresssion equations explaining RAS in 31 matched consumer goods industries. Again relative concentration is positive and highly significant, with RCONC82 yielding the best fit. FSE is once again positive and highly significant, while a dummy signifying whether the industry is a convenience or nonconvenience industry is negative and nearly significant. The sign of the dummy suggests that relative advertising is lower in convenience goods, consistent with our earlier analysis of means.

In consumer goods, RSIZ is always negative and significant whenever it is included in runs also containing relative concentration.

(iii) Producer Goods

Table 3.8 presents multiple regression equations explaining RAS in 15 matched producer good industries. Relative concentration is an extremely powerful determinant of relative advertising, with RCONC3 alone explaining over 50 per cent of the variance in RAS. ARCONC3 performs marginally better than RCONC3, suggesting some modest role for imports.

EFT has a negative though not significant influence on RAS, which goes counter to the hypotheses presented. EXP, however, is negative and generally significant in producer goods as it is elsewhere in the sample.

Table 3-7 Multiple Regression Equations Explaining the Ratio of Canadian to United States Advertising Rates for 31 Matched Consumer Goods Industries

	Intercept	RCONC	RCONC 8	EFT	FSE	Convenience Dummy	RSIZ	TRAD	RCONZ 81	R^2	Corrected R^2
1.	.7685[a] (3.988)	.16942 (1.182)								.046	.013
2.	.5879[b] (2.260)		.32036[c] (1.578)							.079	.047
3.	.4729[b] (1.947)		.82936[a] (3.301)				-5.2786[a] (2.539)			.252[b]	.198
4.	.1049[a] (6.131)						-.66270 (.414)			.006	-.028
5.	.3552[c] (1.622)	.26360[b] (2.027)		.0003473 (1.011)	.0005247[a] (2.746)					.306[b]	.229
6.	.3110 (1.298)		.71589[a] (2.794)		.0004153[b] (2.312)	-.14674 (1.185)	-3.172[c] (1.502)			.408[a]	.317
7.	.3064 (1.273)		.75836[a] (2.953)		.0004699[a] (2.520)		-4.095[b] (2.039)	-.0001331 (1.064)		.402[a]	.310
8.	.7067[a] (3.639)		RCONC 82 .32949[a] (3.052)	.0000404 (.121)	.0004458[a] (2.504)	-.10198 (.814)	-.4.1295[b] (1.823)			.448[b]	.337
9.	.5532[a] (2.645)								.030837[b] (2.169)	.140[b]	.110
10.	.7173[a] (4.222)		RCONC 82 .33203 (3.196)		.0004493[a] (2.609)	-.10425 (.858)	-4.1873 (1.928)			.448[a]	.363
11.	.4297[b] (1.728)	RCONZ 1 .03098[b] (2.003)			.00040107[b] (2.172)	-.07779 (.624)				.319[b]	.243
12.	.2686 (1.105)	RCONZ 1 .02434[c] (1.651)	RCONC 82 .15629[b] (2.233)		.0004632[a] (2.653)	-.13623 (1.142)				.428[a]	.340
13.	.7076[a] (4.195)		RCONC 82 .34913[a] (3.441)		.0004527[a] (2.642)		-4.907[b] (2.461)			.432[a]	.369

Note: figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the F test.

[a] Indicates coefficient is significant at the 99 percent level.
[b] Indicates coefficient is significant at the 95 percent level.
[c] Indicates coefficient is significant at the 90 percent level.

Table 3-8 Multiple Regression Equations Explaining Relative Advertising in Matched Canadian and United States Producer Good Industries (n = 15)

	Intercept	RCONC	RCONC 3	ARCONC	ARCONC 3	EFT	EXP	RSIZ	R^2	Corrected R^2
1.	.6080[a] (4.839)		.084066[a] (4.033)						.556[a]	.522
2.	.7472[a] (6.550)			7.1422[a] (3.586)					.497[a]	.459
3.	.8808[a] (2.947)		.077648[a] (3.455)			-.003107 (.375)	-.002008[b] (2.404)		.713[a]	.635
4.	1.194[a] (4.075)			5.3862[b] (2.514)		-.001051 (1.224)	-.001456 (1.480)		.621[a]	.517
5.	1.056[a] (4.017)				1.1502[a] (3.473)	.0005606 (.713)	-.001381[c] (1.624)		.715[a]	.637
6.	1.530[a] (2.535)	-.62537 (1.220)	.13927[b] (2.543)			-.0005028 (.609)	-.001476[c] (1.597)		.751[a]	.651
7.	1.065[a] (3.906)				.77448 (.973)	-.0009123 (.865)	-.001630 (1.629)	1.1984 .523	.723[a]	.612

Note: figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the F test.

[a] Indicates coefficient is significant at the 99 percent level.
[b] Indicates coefficient is significant at the 95 percent level.
[c] Indicates coefficient is significant at the 90 percent level.

In producer goods, inter-country variations in the pattern of market rivalry appear to dominate the determination of relative advertising levels, and inter-country variations in buyer behavior or message cost functions exert proportionately less influence. Our model yields corrected $\underline{R}^2$ of .64 in producer goods, which exceeds that achieved in nonconvenience goods and greatly exceeds that in convenience goods. This consistent result is in accord with our theory of advertising determination, which assigns buyer-choice processes heavy weight in consumer-goods industries. In producer goods where advertising is not nearly so central in buyer choice, its use reflects proportionally more on the balance of price and nonprice rivalry rather than small variations in the nature of buyers.

(iv) Convenience Goods

Table 3.9 presents multiple regression equations explaining RAS in 15 matched convenience good industries. While relative concentration is positive and significant (RCONC8 yields the best results), its influence is much weaker than it is in other subsamples. FSE is positive and significant, and EFT is positive and marginally significant.

The proportion of variance in RAS explained in convenience goods is greatly lower than in the other subsamples. This supports the view that advertising is the critical element of marketing strategy in these industries, and even small inter-country variations in buyer behavior play a major role in determining the relative advertising levels observed. The impact of market rivalry on advertising appears to be proportionately less important in convenience good industries.

It is of interest to examine the residuals from the regression analysis of RAS in convenience goods for clues as to the causes of the unexplained variance, and relate the residuals to our analysis of retail structure in Chapter 2. In convenience goods, the model overestimates RAS in meat products, and underestimates RAS in soft drinks, tobacco products, and confectionary and related products. Soft drinks are a regional industry in both countries, and differences in the effect of regionality on measured concentration might explain the poor performance of the model there. Confectionary and tobacco products were the only convenience industries where there was some evidence that chain-store penetration was greater in Canada than in the United States. Since greater chain-store penetration would induce higher actual convenience-good manufacturer advertising, the model, which does not control for the generally lower chain-store penetration in Canada, would underestimate the observed RAS.

These explanations provide some support for the impact of retailing structure on advertising behavior and may rationalize some of the poor performance of the model. However, the low percentage of variance in RAS explained signals important differences in buyer behavior for convenience goods in the two countries which remain unaccounted for.

Table 3-9 Multiple Regression Equations Explaining Relative Advertising in Matched Canadian and United States Convenience Good Industries (n = 15)

	Intercept	RCONC	RCONC 8	ARCONC 8	EFT	FSE	RSIZ	R^2	Corrected R^2
1.	.4979 (1.171)		.29771 (.941)					.064	-.008
2.	.3516 (.871)		.28521 (.970)		.0008776[c] (1.751)			.254	.130
3.	.05106 (.117)		.50469[c] (1.688)			.0004864[b] (2.088)		.313	.199
4.	.2478 (.566)		.85931[b] (1.798)				-4.242 (1.516)	.214	.083
5.	.0353 (.083)		.4552[c] (1.544)		.000621 (1.254)	.000391[c] (1.629)			
6.	.9290[a] (3.920)						-.34024 (.178)	.002	-.074
7.	.3546 (1.437)		RCONC 82 .15348[c] (1.455)		.0006470 (1.297)	.0003864[c] (1.591)		.386	.220
8.	-.3794 (.862)		RCONC 82 1.4657[a] (2.836)	ARCONC 82 -4.3278[c] (1.602)		.0003443[c] (1.560)	-5.2393[b] (2.005)	.535[c]	.348
9.	.6754[a] (2.431)		RCONC 82 .44053[b] (2.417)	ARCONC 8 -4.4152 (1.214)		.0003660[c] (1.546)	-5.0278[b] (1.735)	.469[c]	.256

Note: figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the F test.

[a] Indicates coefficient is significant at the 99 percent level.
[b] Indicates coefficient is significant at the 95 percent level.
[c] Indicates coefficient is significant at the 90 percent level.

(v) Nonconvenience Goods

Table 3.10 presents multiple regression equations explaining RAS in 16 matched nonconvenience-good industries. Relative concentration is positive and highly significant, and its performance improves still further in nonlinear specifications and when adjusted for imports. ARCONC82 yielded the best results. FSE is positive and highly significant. IMP is negative and significant when entered as an independent variable, but the performance of the model improves when IMP is used instead to adjust the measured Canadian concentration ratio. RSIZ is positive when entered alone (and its simple correlation with RAS is positive), but it becomes negative and not generally significant when entered with relative concentration, perhaps because of the strong collinearity that is present between the two variables (approximately .9). The inclusion of RSIZ does not improve corrected R^2 but rather diminishes it, though.

The model in nonconvenience goods explains a substantial fraction of the variance in RAS, consistent with our earlier discussion about the lower importance of advertising to marketing strategy in nonconvenience goods as compared with convenience goods. Examination of the residuals in the nonconvenience-good model provides further support for the influence of retailer structure on relative advertising behavior. The model overestimates RAS in tires, appliances, and especially jewelry, three industries where Canadian chain-store penetration exceeds that in the United States. In the presence of powerful chain nonconvenience retailers, relative advertising in the Canadian industries fell, perhaps reflecting the enhanced industry rivalry induced by these powerful buyers. Unlike convenience goods, where the manufacturer's primary strategy for dealing with chains is advertising, in nonconvenience goods chain penetration may shift the manufacturer's strategy toward non-advertising devices like persuasion of the retailer. Also, the substantial bargaining power of the nonconvenience chains, which is not present to nearly the same degree for convenience chains, appears to have a substantial destabilizing influence on manufacturing industry rivalry, thereby reducing advertising. The nonconvenience model underestimates RAS in the radio and television industry, for which we have no explanation, and in men's clothing where Canadian chain-store penetration is less than in the United States.

(vi) Spillover Effect

The consistently positive results with FSE go counter to the importance of a spillover effect from U.S. media. Industries with heavy foreign ownership advertise more, not less. While there is not definitive proof that the spillover effect is not important, when combined with the consistent pattern of results obtained here it cast doubt on the acceptance of the spillover as the dominant influence on Canadian advertising.

COMPARISON OF THE MIX OF ADVERTISING MEDIA IN MATCHED U.S. AND CANADIAN INDUSTRIES

While economic research has placed a great deal of attention on the overall rate of advertising which firms engage in, rather little attention has been focused on the mix of advertising media they employ. Recalling our earlier discussion, there are two main points of controversy about advertising:

Table 3-10 Multiple Regression Equations Explaining Relative Advertising in Matched Canadian and United States Non-Convenience Good Industries (n = 16)

	Intercept	RCONC	RCONC 8	ARCONC 82	FSE	IMP	RSIZ	R^2	Corrected R^2
1.	.5389[c] (1.630)		.45891[c] (1.695)					.170	.111
2.	.7832[a] (4.039)		RCONC 82 .19478[c] (1.739)					.178	.119
3.	.5490[c] (1.697)		.81849[b] (2.114)				-5.2953 (1.273)	.262	.148
4.	.9831[a] (3.520)						+1.1171 (.351)	.009	-.062
5.	.4060[c] (1.457)		47573[b] (2.142)		.0007531[a] (2.721)	-.0004813[b] (2.383)		.538[b]	.423
6.	.8960[a] (8.307)			20.019[a] (2.787)				.357[b]	.311
7.	.6486[a] (3.905)			19.336[a] (2.732)	.0006951[a] (2.701)	-.0001228 (.572)		.607[a]	.508
8.	.8005[a] (3.440)		RCONC 82 .33890[b] (2.455)		.0007194[b] (2.669)	-.0004401[b] (2.258)	-4.3129 (1.193)	.616[b]	.477
9.	.5999[a] (4.320)			21.398[a] (3.609)	.0006358[a] (2.772)			.596[a]	.534
10.	.7351[a] (3.339)			23.472[a] (3.583)	.00062989[a] (2.706)		-1.8620 (.799)	.616[a]	.520

Note: figures in parentheses are t values. The significance of the regression coefficients is tested using a one-tail t test and the significance of the coefficients of multiple determination is tested using the *F* test.

[a] Indicates coefficient is significant at the 99 percent level.
[b] Indicates coefficient is significant at the 95 percent level.
[c] Indicates coefficient is significant at the 90 percent level.

does it provide useful information, and does it contribute to (or work against) the development and maintenance of market power, either indirectly or directly? A strong case can be made that the mix of advertising media employed by the firm is not innocent of implications for both of these questions.

It is clear that the range of advertising media available to the firm (radio and television, both network and spot, magazines, newspapers, billboards, direct mail circulars, and so on) have differing information-transmittal capabilities. For instance, the voice can carry inflections impossible for the printed page to capture; the moving television picture communicates within different boundaries from those of the picture in a magazine; the radio or television announcement is over in seconds, while the printed ad can be viewed at length.

While no one would argue that socially useful information cannot potentially be transmitted via all the media, a certain polarization seems to exist among observers with respect to the "goodness" of the advertising information provided by the different media. The greatest suspicion that advertising information is misleading and dysfunctional seems to revolve around television advertising, while at the other extreme nearly everyone agrees that newspaper ads and direct mail circulars are beneficial information sources. Without venturing into the metaphysical territory of defining just what separates beneficial information from bad, this perception seems to be based on the observation that newspaper and direct mail advertising consist largely of prices and buying locations, while television ads often go much further in linking the product to intangibles such as physical attractiveness, success, image toward other people, and so on. Thus a question can be raised about the equality of advertising media in terms of the social desirability of their information.

Recent work by Porter also raises questions about the equality of advertising media with respect to their influence of market performance. The core of his argument is that the effect of advertising on market power hinges on the ability of sellers to take advantage of the scale economies and/or indivisibilities of national network television and magazines as advertising media. This situation entails cost disadvantages for some firms versus others and creates requirements for capital to be placed in an especially risky use. Advertising media differ substantially in their "effective thresholds", or the degree to which these indivisibilities exist in their supply. The national media such as network television and, to a lesser extent, national magazines have very high effective thresholds. Large minimum outlays are required to reach a national audience regardless of the size and geographic scope of the firm, though the cost per household of reaching the audience is low. Newspapers and direct mail advertising, on the other hand, have very low effective thresholds. Space in these media can be purchased in highly divisible units, and the scope of the audience reached carefully adjusted to the size and scope of the firm. However, the cost per message per household is generally higher for these media. Regional magazines and spot (or local) television fall somewhere in between, regional magazines because of their larger geographic threshold and spot television because of its relatively large minimum outlays and intensive audience coverage. In his statistical analysis, Porter found that the strong

relation between advertising and market power in consumer-goods industries stemmed almost entirely from advertising on network television and magazines, and that advertising on newspapers and spot television appeared to have little impact on market power.[17]

In view of the potential relevance of media mix to both the major social issues raised by advertising, it is of interest to examine the mix of advertising media employed by Canadian firms and their relationship to that employed by similar firms in the United States. We shall first examine the relationship of the media mix employed in a sample of 27 matched Canadian and U.S. consumer-good industries. Following that we shall extend the analysis to investigate the relative media composition of advertising in the two countries of firms operating both in the United States and Canada.

A. THE DIFFERENCES AMONG ADVERTISING MEDIA

As we have described above, advertising media differ in the range of information they can transmit and in their supply-cost functions. Before examining the relative patterns of media usage in Canada and the United States, it is necessary to investigate further the differences among the media and to develop the theory of how their use should vary between Canada and the United States.

Earlier we focused on the social evaluation of information transmitted by the various media, but their information-supply capabilities differ in other dimensions as well. Directly related to the causes of differences in effective threshold levels of outlay among the media is variance in their capacity to adapt their messages to particular consumer groups or geographic markets. The network television or national magazine advertisement transmits the same message to all buyers who consume the medium. However, specialized magazines can be selected to aim different messages to differing buyer groups. Local television or newspaper messages can be adapted to the peculiarities of each local market, and selection of different newspapers even within the same city allows sending ads to sub-metropolitan buyer groups. Thus high threshold media generally have low message flexibility, and vice versa.

Canada - U.S. Differences in Media Mix

Given these differences among media, we would expect Canada's media mix to differ from that of the United States for two primary reasons. First, differences in the nature and composition of the buyer group for given products may affect the appropriate balance among the efficiencies of national media and the flexibility of local media and the relative importance of the differing information-transmittal capabilities of the various media. Second, to the extent that media cost functions or the structure of firm sizes varies between the two countries, the media's relative productivity for firms and the relative impact of their differing threshold levels would vary.

A number of factors point to greater relative use of local versus national media in Canada because of their greater message flexibility. Most observers agree that Canada's major population centers not only are widely separated geographically but differ in language, culture, major economic base, tastes, and other dimensions to a greater degree than is the case in the United States. The greater regional buyer heterogeneity would place a higher

premium on regional message differentiation and thus the use of more flexible regional or local media. Greater language and ethnic diversity in given regions reinforces this tendency, by introducing further market segmentation and thereby enhancing the relative productivity of nonhomogeneous advertising messages in Canada.

The greater propensity to shop and compare products in Canada, which was suggested by the relative demographic and consumption characteristics described earlier, may also have implications for efficient media selection. Buyers engaged in greater comparison shopping would be less responsive to the intangible product appeals often associated with television ads and more responsive to price, performance and buying-location data normally associated with newspapers.

The relative supply cost functions for the various media should differ between Canada and the United States as well. If the shape of the supply cost curves for the media were identical in the two countries, the empirically smaller size of Canadian leading firms (the smaller size of the economy more than offsetting the higher average concentration) would mean that fewer of them could vault the effective thresholds of national media, and then there would be proportionally less advertising on these media in Canada other things being equal. While the basic structure of the media in the two countries appears to be quite similar, however, there are reasons to suspect lower relative economies of scale in national media versus local media in Canada. A greater proportion of affluent Canadians live in the top few largest cities, and the number of major population centers is much fewer (34 SMSAs versus 300).[18] Thus the relative message cost efficiency of using a national medium versus a series of local media may be reduced in Canada. The minimum effective threshold outlay on a national medium in Canada would be lower for the same reasons.

The relationship between the decrease in the threshold outlays and the decrease in firm size in Canada would determine the relative degree to which the use of national media would be precluded in Canadian versus U.S. firms because of the threshold outlays required. This question is difficult to settle on *a priori* grounds. However, the lower relative efficiency in messages transmitted by national media as compared to local media in the smaller Canadian market would work to decrease their proportional use there. This proportionately lower use of national media due to supply cost considerations supports their lower use due to an increased need for message flexibility in Canada.

B. THE PATTERN OF MEDIA USAGE IN CANADIAN CONSUMER-GOOD INDUSTRIES

Table 3.11 gives the pattern of advertising by medium in 27 Canadian consumer-good industries in 1972 (Table 3.12 gives similar data for the United States). The primary advertising media in Canada are spot television and newspapers, both local media, which account for over 70 per cent of media advertising in the four media shown. Television advertising, including network television advertising, is more heavily used for convenience-good industries than for nonconvenience-good industries. This is to be expected since the low propensity to shop for convenience goods means that choice is often based

Table 3-11 Media Usage in Canadian Consumer Goods Industries

	Advertising on Network Television as a Percent of Total Media Advertising	Advertising on Spot Television as a Percent of Total Media Advertising	Advertising on Television as a Percent of Total Media Advertising	Advertising in Magazines as a Percent of Total Media Advertising	Advertising in Newspapers as a Percent of Total Media Advertising	Advertising on Network Television as a Percent of Total Television Advertising	Advertising in Magazines as a Percent of Total Print Advertising
A. Mean Values (percents)							
All Consumer Goods	13.1	36.4	49.5	16.1	34.4	24.6	33.3
Covenience Goods	16.6	49.0	65.6	11.4	23.0	23.3	36.7
Non-Convenience Goods	9.9	24.7	34.5	20.6	44.9	26.0	30.1
B. Correlations with Industry Structural Variables (Consumer Goods, Convenience Goods and Non-Convenience Goods Respectively)							
CAS	.39 .46 .51	.22 .07 .53	.32 .25 .57	-.22 -.12 -.46	-.26 -.28 -.24	.14 .41 .0	.19 .39 -.26
CSALES	.09 -.10 .15	.07 .12 -.07	.09 .06 .67	-.10 .02 -.12	-.05 -.09 .07	.15 -.06 .21	-.08 .03 -.16
TADNC	.39 .35 .26	.23 -.04 .02	.33 .12 .14	-.31 -.18 -.24	-.20 -.07 .06	.23 .49 .19	-.04 .05 -.24
CCR4	-.12 -.20 -.27	-.17 -.57 .15	-.17 -.53 -.5	-.29 .28 -.49	.42 .60 .51	-.27 -.01 -.43	-.46 -.34 -.66
CCR8	-.15 -.22 -.26	-.19 -.67 .24	-.20 -.62 .01	-.30 .37 -.51	.46 .67 .46	-.3[illegible] .02 -.47	-.47 -.26 -.66
CSIZ	.08 -.20 .15	-.04 -.12 -.02	.01 -.18 .06	-.14 .19 -.19	.09 .15 .10	.13 -.07 .16	-.17 -.02 -.22
FSE	.32 .64 .21	.12 .57 .14	-.22 .72 .19	-.28 -.41 -.34	-.09 -.79 .10	.05 .31 -.11	-.02 .54 -.40
EXP	-.16 -.50 .04	-,25 -,45 -.02	-.25 -.57 .01	-.03 .79 -.31	.33 .39 .28	-.16 .60 -.03	-.16 .20 -.35
IMP	-.08 -.13 .15	-.30 -.19 .24	-.25 -.20 .21	-.09 .40 -.37	.38 .07 .09	-.10 -.31 -.14	-.29 .14 -.32
EFT	.04 .36 -.14	-.28 -.22 -.03	-.19 -.02 -.09	.25 .21 .30	.07 .08 -.18	.17 .32 .11	.22 .46 .27
CGROW	-.10 .22 -.14	-.16 .27 -.09	-.16 .31 -.12	.28 .13 .27	.01 -.50 -.11	-.11 .01 -.16	.27 .82 .32
C. Correlations with Matched United States Industry Ratios							
UPERNET	.48 .45 .43						
UPERSPT		.65 .55 .32					
UPERMAG				.63 .81 .61			
UPERNEW					.24 .38 .08		
UPERTV			.62 .57 .35				
RMAGU							
RNETU							.39 .53 .43
						.32 .38 .29	

Table 3-12 Media Usage in United States Consumer Good Industries

	Advertising on Network Television as a Percent of Total Media Advertising	Advertising on Spot Television as a Percent of Total Media Advertising	Advertising on Television as a Percent of Total Media Advertising	Advertising in Magazines as a Percent of Total Media Advertising	Advertising in Newspapers as a Percent of Total Media Advertising	Advertising on Network Television as a Percent of Total Television Advertising	Advertising in Magazines as a Percent of Total Print Advertising
A. Mean Values (percents)							
All Consumer Goods	29.4	23.4	52.8	33.4	13.1	71.1	52.0
Convenience Goods	34.6	36.1	70.7	16.6	11.8	64.2	47.4
Non-Convenience Goods	23.7	9.7	33.3	51.6	14.5	77.5	57.1
B. Correllations with Industry Structural Variables (Consumer Goods, Convenience Goods and Non-Convenience Goods Respectively)							
USAS	.50 .58 .25	.27 -.12 .11	.39 .54 .26	-.40 -.23 -.13	-.50 -.66 -.30	.36 .86 .26	.10 .43 -.10
USALES	.10 .08 .13	-.16 -.31 -.17	-.04 -.20 .05	-16. -.06 .28	.45 .35 .55	-.45 -.48 -.53	.28 .25 .29
TADVU	.58 .77 .23	.15 -.33 -.16	.55 .56 .25	-.55 -.40 -.39	-.11 -.55 .59	-.13 .53 -.64	.31 .66 .34
USCR 4	.19 .10 .28	-.06 -.21 .08	.68 -.08 .28	-.28 .19 -.58	.39 -.02 .76	-.34 .12 -.70	.15 .11 .18
USCR 8	.18 .10 .25	-.05 -.19 .04	.60 -.07 .24	-.27 .19 -.55	.38 -.03 .77	-.33 .11 -.68	.12 .09 .15
USIZ	.10 .29 .15	-.20 -.51 -.14	.69 -.16 .81	-.12 -.01 -.32	.41 ..25 .55	-.37 -.37 -.55	.27 .45 .26
UGROW	-.10 .17 -.30	-.09 .20 -.27	-.14 .38 -.38	.22 -.19 .30	-.19 -.44 .03	.30 .54 -.03	-.14 .03 -.29

on relatively less objective criteria susceptible to most effective advertising on television. Nonconvenience goods have a markedly greater usage of print media than do convenience goods. Heavier use of newspapers is consistent with more careful search behavior for nonconvenience goods, and heavier use of magazines reflects the greater specialization of the buyer groups for nonconvenience goods that can be more effectively reached via special interest magazines. While most convenience goods are sold to nearly all households and can be reached efficiently with television, nonconvenience goods are usually purchased by narrower consumer groups in any given time period. The "wasted" messages of broad audience media make them less cost effective.

Table 3.11 also presents a correlation analysis relating Canadian media usage to various Canadian industry characteristics. For the entire sample of industries, a higher total advertising to sales ratio and higher absolute total advertising in the industry are strongly related to greater use of network television, consistent with network television's higher threshold outlays. Import competition tends to shift advertising away from television and into print media, especially newspapers, as do heavy exports. Tariff protection is associated with higher network television and magazine advertising. Finally, a high proportion of sales by foreign subsidiaries is strongly associated with increased use of network television and also with the greater use of spot television. Thus foreign subsidiaries not only make heavier advertising outlays, as was seen in the last section, but they allocate them differently . The media mix changes we observe for industries with substantial sales by foreign subsidiaries are consistent with the view that in comparison with Canadian manufacturers, foreign subsidiaries sell products with broader appeal, rather than appealing to particular segments, and sell products based on qualities relatively better communicated by television.

The effect of industry characteristics on media use is broadly similar in both convenience and nonconvenience goods, though some important differences occur. A high proportion of foreign subsidiary sales is substantially more strongly related to network and spot television usage in convenience goods. This is consistent with the greater opportunity for intangible product appeals in convenience goods. Imports and exports are associated with lower television and greater magazine advertising in convenience goods, while the reverse is true in nonconvenience goods. Tariff protection is positively associated with network television in convenience goods, while it is negatively associated with it in nonconvenience goods.

The results with the foreign trade variables form a generally consistent set. Restricted free trade in the form of tariff protection or signalled by foreign company production in Canada increases the use of television advertising, while the presence of free trade flows generally reduces television advertising in favor of print advertising.

C. RELATIVE MEDIA USAGE IN MATCHED CANADIAN AND U.S. CONSUMER-GOOD INDUSTRIES

Table 3.13 presents an analysis of the differences between media usage in the 27 matched Canadian and U.S. consumer-good industries. Comparing media usage in matched industries was necessary to control for the basic nature of the product and the way it is purchased. Since media usage varies substantially across industries, aggregate comparisons between the two countries

Table 3-13 The Difference in Media Usage in Matched Canadian and U.S. Consumer Good Industries

	Differene in Percent Network Television of Total Advertising	Difference in Percent Spot Television of Total Advertising	Difference in Percent Television of Total Advertising	Difference in Percent Magazines of Total Advertising	Difference in Percent Newspapers of Total Advertising	Ratio of Network TV to Total TV in Canada to the Ratio in the U.S.	Ratio of Magazine Advertising to Total Print Advertising in Canada to the Ratio in the U.S.
A. Mean Values (percents)							
All Consumer Goods	-15.2	13.9	-1.3	-18.6	20.6	-.274	-.378
Convenience Goods	-18.0	12.9	-5.1	-5.2	11.2	-.241	-.275
Non-Convenience Goods	-11.6	16.3	4.7	-34.6	30.4	-.310	-.473
B. Correllations with Comparative Industry Structural Variables (Consumer Goods, Convenience Goods and Non-Convenience Goods Respectively)							
RAS	-.29 -.27 -.45	-.09 -.16 -.10	-.29 -.36 -.38	-.15 .04 .14	.46 .40 .34	-.35 -.20 -.39	-.46 -.60 -.17
RCONC	.15 .40 -.01	-.27 -.50 .12	-.07 -.09 .05	-.13 -.36 -.60	.20 .23 .56	.07 .48 .05	-.18 -.38 -.43
RCONC 8	.10 .30 .03	-.12 -.36 .18	.0 -.05 .12	-.15 -.24 -.57	.15 .15 .44	.19 .36 .08	-.12 -.27 -.37
RSIZ	.06 .33 -.20	-.25 -.27 -.19	-.12 .04 -.24	.16 -.28 -.37	.0 .05 .68	.15 .38 -.03	.13 .01 -.49
RTADV	-.40 -.30 -.56	-.15 -.04 -.31	-.41 -.28 -.57	.11 .09 .41	.36 .30 .30	-.37 -.23 -.40	-.32 -.22 -.28
RGROW	.12 -.21 .26	.0 .27 -.28	.09 .06 .04	-.37 .09 -.27	.23 -.08 .21	.14 -.41 .39	-.03 .54 -.04
IMP	.27 .06 .32	.11 .26 .08	.28 .26 .28	-.62 -.39 -.46	.24 -.20 .11	.19 -.36 .37	-.43 .20 -.40
EXP	.07 -.09 .16	-.06 -.05 -.08	.01 -.11 .07	-.22 -.11 -.24	.18 .17 .14	-.05 -.49 .15	-.05 .26 -.18
EFT	-.28 -.63 -.18	.15 .26 .02	-.11 .29 -.12	-.03 .23 .37	.16 .28 -.21	-.17 -.62 .06	-.12 -.30 .39
FSE	-.14 -.14 -.21	.54 .74 .20	.25 .50 -.05	-.11 -.19 .09	-.18 -.55 -.01	-.17 -.09 -.15	-.15 -.19 -.05

would produce misleading results due to differences in the mix of output of consumer-good industries. With the industry (product) controlled for, we can examine the effect of differences in buyers and the structure of media in the two countries.

For the same industry, the proportion of network television advertising of total advertising in all media is substantially greater in the United States than in Canada, as is the proportion that network television is of total television advertising. Spot television advertising is markedly greater in Canada both as a percentage of total advertising and as a percentage of television advertising. Magazine advertising is proportionately less relative to total advertising and to print advertising in Canada, while newspaper advertising is proportionately greater along both dimensions. These differences are consistent with our theoretical predictions presented earlier.

The pattern is substantially similar when we compare convenience and nonconvenience goods. The difference in network television advertising in Canada relative to the United States is most marked in convenience goods, for which network television advertising is very important in the United States (see Table 3.12), while the increase in proportional spot television advertising in Canada is greatest in nonconvenience goods. The shift between magazine and newspaper advertising that is present in Canada relative to the United States is considerably greater in nonconvenience goods than in convenience goods. Magazine advertising is very important in the United States for nonconvenience goods (see Table 3.13), and the differences in buyer characteristics and media cost functions in the two countries not surprisingly show up strongest in these industries. The sharp reduction in proportional magazine advertising in Canada relative to the United States may also be due to differences in the array of magazines available to the advertiser in the smaller Canadian economy. Magazines draw their comparative advantage in nonconvenience goods from providing a selective audience for the manufacturer relative to television and newspapers. If there are fixed costs in publishing specialized magazines, there may be fewer specialized magazines available in Canada than in the United States. A tabulation by P. Zarry found that the number of consumer magazines in Canada had declined between 1965 and 1972, the only advertising medium to show such a decline.[19] If this decline reflects the difficulty of survival of specialized consumer magazines, this may contribute to the relatively lower use of this medium by nonconvenience-good manufacturers in Canada.

COMPARATIVE ANALYSIS OF THE MIX OF ADVERTISING MEDIA EMPLOYED BY CONSUMER-GOOD FIRMS OPERATING IN BOTH CANADA AND THE UNITED STATES

Our analysis in the previous section examined differences in media usage in matched Canadian and U.S. industries. We found substantial differences in the pattern of media employed in the two countries, and also found that industries where foreign subsidiaries accounted for a substantial proportion of sales had different advertising behavior from Canadian firms.

Table 3-14 Mean Values of Media Mix in Canada and the United States for Large Firms Operating in Both Countries

(figures in percents)	Percent Network Television Advertising to Total Advertising	Percent Spot Television	Percent Radio	Percent Magazine	Percent Newspaper	Percent Television	Percent Electronic	Percent Network TV of Total Electronic	Percent Magazine of Total Print	Percent Radio of Total Electronic
A. CANADA										
All Consumer Goods	9.0	29.6	16.3	17.4	27.6	38.6	54.9	15.2	36.2	35.2
Convenience Goods	11.1	36.3	19.4	13.3	19.8	47.4	66.9		38.4	
Non-Convenience Goods	18.9	23.0	18.3	13.2	36.5	31.9	50.2	18.8	27.8	40.7
B. UNITED STATES										
All Consumer Goods	26.0	23.7	0.9	28.1	21.8	49.6	50.5	44.2	61.2	3.6
Convenience Goods	28.5	28.2	0.9	20.4	21.9	56.7	57.6		56.2	4.2
Non-Convenience Goods	22.3	14.5	1.0	36.0	26.0	36.9	37.8	48.9	58.8	

Examining media outlays in matched industries controlled for the basic nature of the product and the way it was purchased. However, the nature and assortment of products sold in the two countries could differ, and the construction of industry average media mix from the media outlays of samples of firms in them could introduce biases into the results. In order to minimize the difficulties of the matched-industry comparison, we examined the relative media outlays in Canada and in the United States of large firms that operated in both countries. Looking at the same firm in two countries controlled for the essential features of the product and product line (though the product lines could differ in the two countries), and probably controlled for the basic marketing philosophy being followed. This comparison, then, focused sharply on the differences between buyers and the structure of the media in the two countries. The firm-level comparison also included radio advertising, which was not measured in the industry comparison reported above.

The choice of firms operating in both countries was not without its own special features, however. The great majority of these firms was based in the United States or Western Europe, and thus these firms were foreign subsidiaries in Canada. As we have seen, foreign subsidiary advertising behavior in Canada is somewhat different from that of Canadian companies. Thus this test will allow us to determine whether the differences in media usage in the two countries hold for foreign firms as well as Canadian firms. Unfortunately we cannot compare the advertising behavior of our sample of primarily foreign firms to the Canadian industry sample, because of the differences in the mix of industries, which would bias the comparison.

Table 3.14 give the mix of media employed by the firms in the sample in Canada and in the United States, and Table 3.15 gives comparisons between the media mix in Canadian and U.S. media employed by the firms. The same pattern of median differences in the two countries is apparent. Even with the same basic product assortment and marketing philosophy, firms use substantially less network television advertising in Canada than in the United States, and more spot television advertising. They made less use of magazines, especially in nonconvenience goods where magazine advertising was important in the United States. The proportion of magazine advertising to total print advertising was much greater in the United States than in Canada. The results lend strong support to the importance of variations in the buyer population and the structure of the media in influencing the differences in media mix in the two countries.

The availability of data on radio advertising highlights another important difference in the use of media in the two countries. Radio advertising is much more important in Canada than in the United States and represents a substantial share of electronic advertising in Canada. Since radio is a local medium and a relatively factual one, these results are consistent with our earlier discussion about buyer differences in the two countries. The greater relative use of radio may also be due to the higher relative proportion of radio sets to television sets in Canada as compared to the United States.

Table 3-15 Mean Values of Differences in Media Mix in Canada and the United States for Large Firms Operating in Both Countries

(Figures in percents)	Difference in Percent Network Television to Total Advertising	Difference in Percent Spot Television to Total Advertising	Difference in Percent Radio to Total Advertising	Difference in Percent Magazines to Total Advertising	Difference in Percent Newspapers to Total Advertising	Difference in Percent Television to Total Advertising	Difference in Percent Electronic Advertising to Total Advertising	Ratio of the Share of Network TV to Total Electronic Advertising in Canada to its Share in the U.S.	Ratio of the Share of Magazine to Print Advertising in Canada to its Share in the U.S.	Patio of Radio Share of Total Advertising in Canada to its Share in the U.S.
All Consumer Goods	-16.9	5.9	15.4	-10.8	6.4	[illegible]	[illegible]	.263	1.15	5.36
Convenience Goods	-17.4	8.1	18.6	-7.1	-2.1	[illegible]	[illegible]		1.87	
Non-Convenience Goods	-13.4	8.5	17.3	-22.7	10.4	[illegible]	[illegible]	.225	.37	7.34

NOTES TO CHAPTER 3

1. Dominion Bureau of Statistics, (1968) p. 6.

2. Scherer (1970), p. 326.

3. Porter (1976), Chap. 5.

4. Baker (1965) and Munn (1966).

5. Sutherland (1963).

6. Mallen (1971), pp. 52-59.

7. For a survey of these hypotheses see Porter (1976, Chap. 5) and Fergusen (1974).

8. Canada Dominion Bureau of Statistics, Statistics Canada, Canada Year Book (1969) (Ottawa) and U.S. Bureau of the Census, Statistical Abstract of the United States, (1965) (Washington, D.C.)

9. Kaldor and Silverman (1948) pp. 30-31.

10. Borden (1942) pp. 66 and 442.

11. Kaldor and Silverman's sample of matched industries was more heavily weighted toward convenience goods than ours, and of course was composed solely of consumer goods.

12. The substantial drop in advertising levels suggests increasingly efficient advertising media, economies of scale due to the large increase in population and efficiency in information transmitted due to the urbanization of the population. These factors apparently outweighted the effect of rising incomes and education levels, the rise of chain retailers, etc.

13. Caves and Porter "From Entry Barriers to Mobility Barriers" forthcoming Quarterly Journal of Economics (May 1977), pp. 241-261.

14. Alemson (1970), pp. 282-306.

15. Porter (1976), Chap. 6.

16. Supporting this line of reasoning is Zarry (1973), finding that only 27 of the top 100 advertisers in Canada were not subsidiaries of foreign companies while 54 of the top 100 companies were Canadian. Since this comparison does not control for the mix of producer and consumer good companies in the top 100 companies it is not conclusive.

17. Porter "Interbrand Choice, Media Mix and Market Performance," (1976).

18. Dixon (1962).

19. Zarry, P.T., "Advertising and Marketing Communications in Canada, in Thompson and Leighton (1973), p. 243.

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PART TWO

DIVERSIFICATION IN MANUFACTURING INDUSTRIES

Chapter 4

OUTPUT DIVERSITY AND SCALE:

COMPANIES AND MARKETS

R.E. Caves

Diversity of outputs is, in a sense, a hallmark of the large corporation. If every company were confined to a single product market, its maximum size would be limited by the size of that market and the maximum share it could attain. A diversified company operates in markets other than its principal one. It may diversify to produce inputs to its principal activity or carry on activities that require its principal output as an input; this form of diversity becomes vertical integration if goods are actually transferred between the company's divisions. It may diversify to produce the same outputs in geographic markets other than its principal base, becoming a multiregional enterprise. In the narrower and more popular sense of diversification, it may carry out activities unrelated to its principal one, or related only in their use of common distribution channels, raw materials, or general capabilities of the enterprise. Vertical integration, geographic diversification, and conventional output diversification are related in important ways, and together they exhaust the ways in which a company can expand beyond the bound of (what we define as) its principal market. This chapter deals with the diversity of Canadian companies' outputs measured in a way that generally does not distinguish between vertical integration and "outright" diversification. Geographic diversification is not immediately under study, but we consider its influence here and there.

The effects of output diversity raise a number of questions for the performance of the Canadian economy. Does the large diversified firm increase the economy's productivity by allocating capital efficiently among industries, or does it reduce efficiency by spreading its managerial capability too thinly? Does the diversified firm impair the competitive process by dipping into its "deep pocket" to threaten smaller and more specialized rivals, or does it improve competition by moving into industries whose entry barriers repel would-be entrants that are newborn firms? Our statistical analysis aims at some tests of these and other propositions about the effects of diversification. These tests are imperfect, however, and hence many of our inferences about the effects of diversity must come indirectly from the evidence about its cause. The following sections set forth our approach to the analysis of diversification and then explore various aspects of its causes and effects.

CONCEPTUAL FRAMEWORK

Economic theory provides a framework for analyzing the firm's decision to diversify and thereby explaining its attained level of diversification. The firm that decides to diversify must commit some of its scarce resources to the project: however it diversifies (adding a new product line to its existing plant, building a new plant, acquiring a going company in another market) it must divert funds away from competing uses. Diversification projects also drain other scarce resources of the firm, such as the time and energy of its top management.

The profit-maximizing firm presumably makes decisions to diversify in the same way it makes other investment decisions. The firm has access to funds for expansion, either generated internally from past earnings or borrowed on the capital market. These funds have an opportunity cost that defines the minimum rate of return the firm must expect from any uses to which they are put. To this supply schedule of investible funds the firm compares its ongoing inventory of possible investment projects, which we can imagine as ranked according to the internal rates of return that they are expected to yield. Some of these projects involve diversification (in any of the senses noted above); others seek the expansion of output or the reduction of operating costs in activities to which the firm is already committed. In each period of time the profit-maximizing firm undertakes the best projects in its planning inventory, with the poorest one undertaken promising an internal rate of return no lower than the opportunity cost of the funds required to finance it. New projects (diversifications and other) are continually added to the inventory of plans as the firm processes new information coming available to it. The diversity of a firm's output at any point in time results from the diversification projects it has undertaken in the past, to the extent that these have met its minimal expectations and hence been kept alive.

Although economic theory can describe this optimization process with considerable sophistication, it offers only some general suggestions about the extent and character of diversification projects that will actually be chosen by firms in any given situation:

1. Some outputs, though destined for different markets, require common inputs for their production and are subject to joint costs. Formally, the more *x* a firm is producing, the lower are the marginal costs of producing any given volume of *y*. Byproducts are an example of joint outputs in production. A company's nonmanufacturing activities also entail important joint and common costs; a distribution system set up to handle *x* can often distribute *y* as well at modest additional cost.

2. Even without specific elements of joint cost, the firm is likely to find itself at any given time with excess capacities in some of its facilities: for instance, plant capacity, management, distribution channels. Often these resources cannot be added in units small enough that a new one is fully utilized as soon as it comes on-stream. Or the firm may simply overestimate its short-run needs. In either case, the firm with short-run excess capacity is more likely to find diversification attractive to the extent it can use the excess capacity at no opportunity cost to carry out the diversifying activity.

3. The most extreme form of an underutilized capacity is that of an intangible asset, such as a trademark. When it is attached to product *y*, no less of its goodwill remains available for attachment to product *x*. Therefore firms that acquire proprietary intangible assets are likely to diversify into other activities that utilize those assets.

Economic analysis also suggests some connections between conditions in the company's base or primary activities and the extent and character of its diversification. The lower the opportunity cost of funds and the lower the expected yields from investing them in its established activities the more of its resources does the firm devote to diversification. Consider a company based in a slow-growing oligopolistic industry. It is likely to earn some excess profits that provide it with an ample supply of liquidity. Reinvestment in its primary activity is unattractive beyond the point at which the firm requires an enlarged market share to sell its additional output, because the ensuing competition will tend to depress its rate of profit. For various reasons the firm may assign a low priority to returning the funds to its shareholders as dividends. Hence diversification becomes attractive.

The analysis can be extended to cover the firm's choice of a method by which to diversify its activities. It can add a product line to one of its existing plants or it can acquire a new manufacturing establishment. It can build that establishment or acquire it on the market through a cash purchase or through acquisition of or merger with the company that owns it. Whether or not to add product lines to an existing production facility probably involves trading off any gains from operating that facility on a larger overall scale against the increased costs of coordination that follow from a more complicated menu of outputs.[1] Whether to diversify by acquiring existing production capacity depends on the asking price. Mergers and acquisitions can be thought of as occurring in a "market for corporate control" over existing managerial units. Firms on the market are a heterogeneous population, of course, with their supply prices dependent on various quirks of the situations of their present owners. Hence every transaction in the market for ongoing enterprise is unique, and a buyer can wind up diversified, and diversified in a particular direction, for no more general a reason than that it found a bargain in the market for corporate control. For this reason if no other, one cannot expect to explain much of the patterns of diversificaton we observe on the basis of general forces operating in the economy.

DATA BASE AND MEASUREMENT OF DIVERSIFICATION

The data we use to study diversification have special properties that must be considered at the outset. Dun & Bradstreet offer a commercial service known as Dun's Market Identifiers, a continuously updated file of information on manufacturing and other industrial establishments in Canada as well as the United States. Each establishment's record shows the headquarters to which it reports, the number of employees at that location, and the principal product or activity (and as many as five secondary products or activities) described by a four-digit number of the U.S. Standard Industrial Classification (S.I.C.). No figures are given for total sales or for sales or production of individual product lines, but the four-digit numbers describing the product mix always place the principal product first, the secondary products are arrayed in decreasing order of importance for nearly all establishments. The coverage of establishments in the service is believed to be quite complete, although the file at any one time presumably contains a few records of establishments that have ceased operations and omits others that have just started up.

We secured from Dun & Bradstreet (hereafter D&B) a tape containing the records for all Canadian establishments employing 50 or more people and engaged principally in manufacturing. A total of 4,497 usable records of plant activities were secured. Using the D&B system of code numbers we assembled these establishments into enterprises by following along all channels of ownership (branch and subsidiary relationships) until an ultimate parent was reached. This process yielded a total of 2,117 companies, including 15 that were classified primarily to nonmanufacturing activities.

One consequence of the continuous updating of the D&B file is that its information does not pertain to any particular date. Probably most of its records were secured or checked during 1974 and 1975. However, there is apparently a residue of older information, for we uncovered some product information based on the previous version of the United States Standard Industrial Classification, which was replaced in 1972.

The D&B information on establishments' activities can be used for the study of diversification only if its limitations are kept clearly in mind. The first question is whether a description of a plant's activities in terms of the U.S. Standard Industrial Classification can be taken to convey any useful information on diversification. A moment's reflection reveals that any comparison of output diversity across sectors of the economy must depend on the homogeneity and regularity of some system for classifying and subdividing products. The standard industrial classification system used by the United States is in fact reasonably well suited for this purpose. It distinguishes products on the basis of differences in production technology and inputs as well as on the basis of physically and legally independent production facilities. The census "industry" is typically a "branch of a trade," perhaps inappropriate for the economic definition of a market because it ignores the existence of close substitute products based on different technologies, or because it couples end products that are poor substitutes for another in use.[2] But these features are advantageous for the study of diversification, a concept that depends, at least when considered at the plant level, on physical differences among production facilities and processes. The U.S. classification is subdivided: with 20 two-digit industries in manufacturing, 142 three-digit industries, and 451 four-digit industries. This four-digit classificaton, used by Dun & Bradstreet, is probably as reasonable as any that could be secured. It is somewhat finer than the classification of three- and four-digit industries used by Statistics Canada for reporting production data.

If we accept the classification scheme used in the D&B files to describe the diversity of plants' outputs, the next question is how to assemble these data to describe the output diversity of their parent firms. We are not given the actual value of shipments resulting from the various activities carried on in each plant, only the ranked list (mentioned above) of the plant's primary activity and up to five secondary activities. Thus some activities may be omitted for plants that report the maximum number of secondary activities, and we do not know what weights to attach to the ones that are reported. On the basis of previous experimentation with the D&B data,[3] we made use of the rankings of establishments' activities in the following way. Employees in each company's plants were "assigned" to its various products according to a geometric series, giving the least important

a weight of 1, the next a weight of 2, then 4, 8, 16, and 32. Thus, if one secondary activity is listed for a plant, we assume that its primary activity comprises 67 per cent (2/3) of its total production; if five secondary activities are listed, the assumed share of the primary activity drops to 51 per cent (32/63). With this assumption made, the activities of a firm's various plants can be aggregated and measurements calculated of the diversity of the firm's output as a whole.

The final question is, what should those measures be? Ideally we should derive the appropriate measure of diversity from our theory about the causes or effects of output diversity. Alas, the guidance of economic theory in this case is too general in most respects to designate a particular measure. Furthermore, different hypotheses about diversity offer up different considerations for the appropriate construction of the measure. We therefore proceeded in an eclectic manner to derive six measures of output diversity. We shall describe them starting with the simplest.

Earlier studies of diversity in U.S. manufacturing industries often used a simple count of product to measure diversity,[4] and we included such a measure although we felt it could be improved upon. Specifically, we calculated:

<u>NS</u> Number of unduplicated output classes reported by all plants classified to a company.

<u>NS</u> makes no use of our information on the rankings of activities carried on by a firm's various plants.

The next measure is only slightly more complex. One relevant dimension of diversity is the proportion of a company's activity that lies outside its principal or base market. Using our estimate of the employees associated with each of a firm's activities, we identified the activity accounting for more employment than any other, and computed the fraction that employees allocated to that activity comprise of all its employees:

<u>DE4</u> Employment assigned to the U.S. four-digit S.I.C. industry accounting for more of a firm's employment than any other industry, divided by total employees in the firm's manufacturing establishments.

We also computed the related measure <u>DE3</u>, which is based on the proportion of employees assigned to the firm's principal three-digit industry (determined by pooling all industries with the first three digits identical). Both <u>DE4</u> and <u>DE3</u> measure diversity inversely; in the statistical analyses described below we typically subtracted them from unity to secure a positive measure of diversity.

<u>DE3</u> and <u>DE4</u> take no account of the number of activities in which the firm engages, just as <u>NS</u> takes no account of its concentration on its chief activity. The final three measures employed were designed to reflect both dimensions of diversity. All three are calculated from the vector of numbers of employees assigned to each of a firm's activities by application

of the geometric-series weights described above expressed as proportions of the firm's total employment. The first measure used in the Hirschman-Herfindahl index, commonly used to measure concentration in both its aspects of small numbers and unequal size. Here we employ it inversely as a measure of diversification:

$$\underline{DH} = 1 - \sum_i p_i^{\,2}$$

Use of the Herfindahl index to measure diversity was first proposed by Berry in 1971.[5] Because the employment proportions are squared, the Herfindahl index gives the firm's top few four-digit activities a great deal of weight in determining the extent of measured output diversity. The index ranges from zero, when the firm produces a single product, to one, approached when it produces many products in equal proportions.

The remaining two indexes share two properties. Both avoid the use of squared proportions of employment, in contrast to the Herfindahl measure. And both take account of the "distance" between pairs of products turned out by a diversified firm. The concentric index of diversification is:

$$\underline{DC} = \sum_j p_j \sum_i p_i d_{ij}$$

The employment fraction $\underline{p_i}$ is defined as before; $\underline{d_{ij}}$ is a weight whose value depends on the relations between products $\underline{i}$ and $\underline{j}$ in the standard industrial classification. That is, $\underline{d}$ takes a value of zero if $\underline{i}$ and $\underline{j}$ are four-digit products within the same three-digit industry, one if they are in different three-digit industries but the same two-digit industry, two if they are in different two-digit industries. The index increases with diversity and ranges in value from a minimum of four, approached when there are many four-digit products, no two in the same two-digit industry.[6]

The weighted index is similar to the concentric index but measures diversity in terms of distance out the branches of the classification tree from the product group taken as "primary" for the firm. The primary activity is the three-digit industry assigned a larger fraction of the firm's employment than any other--the same base as that identified for calculating DE3. The weighted index is defined:

$$\underline{DW} = \sum_i p_i d_{ih}$$

In this index $\underline{d_{ih}}$ is a weight that equals zero if the four-digit product $\underline{i}$ is included within the three-digit primary industry, one if it is in a different three-digit industry or two if it lies within a different two-digit industry. The weighted index thus assigns a significance to the firm's primary activity that the concentric index does not. But the concentric index takes account of the distance of secondary products from one another, which the weighted index does not. The weighted index increases with diversity from a value of zero, when the firm's outputs all lie within a single three-digit industry, to a maximum to two, approached when it produces many products, all lying in two-digit industries different from the one comprising the largest single share of employment.[7]

These measures of diversification calculated from the Dun & Bradstreet file could be supplemented by two taken from the Canadian census of production. They describe the extent to which manufacturing establishments classified to an industry and manufacturing companies classified to that same industry fail to overlap. Diversified companies in the industry can own establishments whose primary products are classified to other industries. Or establishments classified to the industry can belong to diversified companies based in other industries. From published data we can secure the following:

SPL One minus the enterprise industry specialization ratio (enterprise industry specialization ratio is defined as value added by establishments classified to the industry and owned by enterprises classified to the industry divided by value added to all establishments belonging to enterprises classified to the industry).

OWN One minus the ownership specialization ratio (defined as the ratio of value added to the primary establishments of the enterprises classified to the industry to value added of all establishments classified to the industry).

SPL measures diversification outbound from a base industry, like the indexes developed from our D&B data. OWN indicates diversification inbound to an industry. Both indexes pertain to the industry as a whole (as defined in the Canadian standard industrial classification) and not to the individual enterprise. The six measures of companies' diversity taken from the Dun & Bradstreet data were also aggregated to the industry level, using each member firm's employment as a weight; in order to permit comparison to SPL and OWN and, more importantly, to explore their behavioral relation to other characteristics of these industries.

How similar are these measures of output diversity? Examples are easily constructed of industries that differ in their ranking by any pair of these measures. It is an empirical question whether or not Canadian industries actually differ so as to make these rankings diverge. In Table 4.1 we present the matrix of zero-order correlation coefficients for these variables, including OWN, although it measures diversification into rather than out of an industry. The number of observations underlying each correlation coefficient is 79 for all coefficients using D&B-derived variables, 123 for SPL and OWN.

Each pair of diversity measures is significantly correlated well beyond the 1 per cent confidence level; thus their empirical similarity is rather high. The highest correlations are among DCI, DWI, DE3I and DE4I,[8] a natural result because all of them measure to some degree the proportion of the output of enterprises classified to an industry that is sold in other markets. Less highly correlated with other variables and with each other are DHC, NSI and SPL. Each is "more different"--the Herfindahl measure involving the use of squared proportions, NSI neglecting output shares entirely, and SPL recognizing diversified outputs only when they are produced as primary products of separate plants. SPL is more highly correlated with NSI than with any other measure, perhaps both tend to take high values in industries populated by large enterprises. A big company could be relatively undiversified by, say, DH and yet make a large number of products (NS) in plants specially set up for them (SPL).

Table 4.1

CORRELATIONS BETWEEN MEASURES OF DIVERSIFICATION OF COMPANIES CLASSIFIED TO 79 CANADIAN INDUSTRIES*

	Diversification Measure						
	NSI	DE4I	DE3I	DHI	DCI	DWI	SPL
DE4I	-.706						
DE3I	-.612	.747					
DHI	.536	-.708	-.535				
DCI	.709	-.924	-.809	.667			
DWI	.618	-.819	-.799	.588	.942		
SPL	.582	-.406	-.299	.339	.396	.317	
OWN	-.118	-.196	-.112	.075	.131	.075	.002

* - All correlations are significant at 1 per cent except those involving OWN. The correlation between OWN and DE4I is significant at 5 per cent.

The indexes of outbound diversity of industries are largely uncorrelated with diversification inbound to them (OWN), but the negative correlation with DE4I is significant at 5 per cent. We discuss the relation between inbound and outbound diversification below in Chapter 5.

PATTERNS OF DIVERSIFICATION IN CANADIAN COMPANIES

The diversification of Canadian manufacturing companies has long been a concern of public policy. A commonly held view is that Canadian plants suffer not only from small scale (failure to exhaust the available economies of scale) but also from excessive diversification resulting in short production runs or high coordination costs.[9] So far as diversified production in a large plant is an alternative to diseconomies in the operation of extremely small specialized plants, these two problems are really just two manifestations of the same underlying constraint of the small size of Canadian markets. Whatever the nature of the problem, the level of diversity in Canadian production is a matter of concern for public policy.

A previous study confirmed the relation between the size of the Canadian economy and the output diversity of its production units. Plants of any given absolute size (measured by employees) in Canada are more diversified than like-size plants in comparable industries in the United States. The leading companies in Canadian industries are less diversified than the (much larger) leading companies in counterpart U.S. industries, though apparently more diversified than U.S. companies of comparable average size.[10] All of these results are consistent with an influence of small market size on diversity in Canada. This consistency extends to the lower diversity observed in leading companies in Canada as compared to the United States; the leading firm in a market faces certain opportunities and incentives for diversifying its output, and the lesser response of Canadian companies reflects the constraint of their smaller absolute size, and hence the diseconomies of small scale that they encounter when they undertake diversification ventures that could be handled with tolerable efficiency by a larger U.S. company.

We can supplement these conclusions by means of some analyses of our indexes of Canadian companies' diversity. National average figures themselves mean little. We need to impose some control for difference in base industry, company size, or other obvious influences on diversification. Table 4.2 contains figures for the six diversity indexes calculated from Dun & Bradstreet data. The companies were classified to their primary two-digit industries in U.S. standard industrial classifications, and averages and standard deviations were then calculated using each company's manufacturing employment as a weight. SPL is not tabulated, but we do include a measure from the Dun & Bradstreet data of the extent of companies' multiplant development. It is NP, the employment-weighted average number of plants per company, and it includes plants classified to the company's primary industry as well as plants whose primary outputs represent diversifications.

Consider first the overall averages shown in the bottom line of Table 4.2. The typical company (in our weighted-average sense) operates 7.4 manufacturing establishments (the unweighted figure is 2.1) and carries out activities in its manufacturing establishments that fall into 6.9 different

categories of the U.S. Standard Industrial Classification (unweighted, 2.6). Thirty-eight per cent of its employees are engaged in activities outside its primary four-digit industry (unweighted, 22 per cent) and 31 per cent are outside its principal three-digit industry (unweighted, 18 per cent). Finally, we can use the "numbers equivalent" property of the Herfindahl measure of concentration, which allows us to equate the DH measure of diversity for an actual company to a hypothetical company that utilizes equal numbers of its employees to make each product it produces. The value of DH, 0.488, would correspond to a hypothetical company producing 1.95 products (unweighted, 1.42).

The differences among industries in Table 4.2 are more easily grasped when the industries are ranked by the diversity measures as in Table 4.3. There is a fairly strong consistency in the rankings by the six indexes of diversity. Tobacco and pulp and paper generally stand at the top of the list; apparel, printing, and the miscellaneous industries at the bottom. The primary industries (textiles, wood products, metal) tend to be less diversified than the secondary industries (food processing, paper, tobacco). Some industries evidently appear diversified just because of the technical heterogeneity of their main lines of products (chemicals, electrical machinery).

Differences in rankings, related to differences in the construction of the diversity measures, provide further insights. The food sector ranks much lower on DW and the instruments sector much higher than their positions on other measures. The food processors' diversification is mostly within that two-digit sector, whereas the instrument sector wanders far afield. This pattern is supported by comparison of the rankings on DE3 and DE4 [11] Food appears less diversified on the three digit measure, as do the furniture, leather, and machinery industries--all sectors that probably diversify close to home on the basis of common raw materials and/or distribution channels. Conversely, the wood-products, petroleum, rubber, and instruments sectors tend to diversify relatively far along the S.I.C. tree; part of their diversification is still technology-determined because common raw materials are converted into finished products that are classified to different two-digit sectors.[12] The tobacco firms also diversify far from their primary base; tobacco's margin of superiority over other industries is much greater for the DW measure than the others.

Some useful information emerges from the ranking of sectors on the extent of their multiplant development (NP). A sector can have extensive multiplant development either because it is diversified or because its base activity entails economies of multiplant operation. The food and primary metals sectors shown extensive multiplant development but are not highly diversified.[13] A highly diversified sector with low multiplant development must be cramming a number of products into its plants. The furniture, metal fabricating, nonelectrical machinery, and instruments sectors fall into this category, a fact probably consistent with technical complementarities in their production processes.

Finally, a bit of information can be extracted from the standard deviations in Table 4.2. Those for the petroleum firms tend to be low relative to their mean values, confirming the standard impression that the larger petroleum companies are quite similar to one another. Standard deviations tend to be relatively high for the miscellaneous industries. High standard deviations

Table 4.2

Weighted means and standard deviations of diversification measures, companies classified to 20 principal industries*

Industry	Diversification measure						
	NS	DE4	DE3	DH	DC	DW	NP
Food processing	10.99	0.62	0.72	0.49	1.08	0.42	12.42
	(13.00)	(0.27)	(0.26)	(0.31)	(0.31)	(0.77)	(14.02)
Tobacco	9.90	0.44	0.44	0.68	1.74	0.90	6.58
	(3.82)	(0.24)	(0.24)	(0.27)	(0.73)	(0.42)	(2.55)
Textiles	5.22	0.69	0.72	0.41	0.93	0.39	5.17
	(3.80)	(0.24)	(0.24)	(0.28)	(0.70)	(0.36)	(4.82)
Apparel	2.55	0.76	0.82	0.32	0.67	0.26	2.20
	(1.68)	(0.22)	(0.20)	(0.27)	(0.62)	(0.31)	(1.34)
Wood products	4.12	0.69	0.71	0.40	0.99	0.44	4.35
	(2.60)	(0.22)	(0.22)	(0.26)	(0.70)	(0.37)	(2.80)
Furniture	5.00	0.60	0.75	0.49	1.08	0.47	4.25
	(5.11)	(0.27)	(0.27)	(0.31)	(0.88)	(0.53)	(4.61)
Pulp and paper	11.12	0.51	0.52	0.62	1.56	0.70	16.16
	(8.64)	(0.20)	(0.20)	(0.22)	(0.61)	(0.34)	(15.24)
Printing, publishing	3.44	0.77	0.79	0.32	0.78	0.32	4.28
	(3.11)	(o.21)	(0.21)	(0.27)	(0.67)	(0.32)	(4.04)
Chemicals	6.70	0.56	0.62	0.53	1.28	0.56	6.86
	(5.28)	(0.26)	(0.25)	(0.28)	(0.70)	(0.37)	(6.98)
Petroleum	8.46	0.70	0.70	0.46	1.33	0.58	9.39
	(5.39)	(0.14)	(0.11)	(0.19)	(0.50)	(0.26)	(5.99)
Rubber	6.46	0.64	0.64	0.50	1.36	0.61	5.73
	(3.61)	(0.18)	(0.18)	(0.23)	(0.60)	(0.32)	(3.26)
Leather	3.41	0.59	0.80	0.50	1.04	0.39	3.16
	(1.66)	(0.22)	(0.17)	(0.25)	(0.64)	(0.32)	(2.06)
Stone, clay, glass	6.47	0.62	0.64	0.48	1.24	0.54	6.66
	(5.44)	(0.27)	(0.24)	(0.29)	(0.78)	(0.40)	(5.83)
Metals	7.90	(0.68)	0.74	0.45	1.07	0.46	9.71
	(4.52	(0.22)	(0.22)	(0.24)	(0.65)	(0.42)	(7.60)
Metal fabricating	5.32	0.61	0.66	0.51	1.32	0.62	4.66
	(3.52)	(0.22)	(0.23)	(0.27)	(0.76)	(0.43)	(4.37)
Machinery (nonelectrical)	3.56	0.65	0.69	0.45	1.14	0.52	2.17
	(2.10)	(0.22)	(0.21)	(0.25)	(0.67)	(0.37)	(1.44)
Electrical machinery	8.62	0.54	0.62	0.59	1.30	0.52	7.20
	(7.15)	(0.23)	(0.24)	(0.27)	(0.66)	(0.33)	(0.52)
Transportation equipment	4.91	0.63	0.77	0.48	1.07	0.44	4.43
	(4.17)	(0.23)	(0.24)	(0.26)	(0.76)	(0.46)	(3.32)
Instruments	3.69	0.66	0.69	0.43	1.17	0.60	2.38
	(2.84	(0.23)	(0.24)	(0.28)	(0.81)	(0.48)	(1.81)
Miscellaneous	3.37	0.73	0.77	0.36	0.97	0.45	2.55
	(2.50)	(0.21)	(0.20)	(0.26)	(0.73)	(0.40)	(2.21)
Total	6.92	0.62	0.69	0.49	1.16	0.50	7.44
	(7.09)	(0.24)	(0.24)	(0.28)	(0.73)	(0.40)	(9.13)

* Standard deviations appear in parentheses below the measures.

Table 4.3

Rankings of twenty broad Canadian industries by average extent of diversification on seven measures of diversification*

Industry	NS	DE4	DE3	DH	DC	DW	NP
	Diversification Measure						
Food	2	9	12	8	11.5	16	2
Tobacco	3	1	1	1	1	1	8
Textiles	11	15	13	16	18	17.5	10
Apparel	20	19	20	20	20	20	19
Wood	14	16	11	17	16	15	13
Furniture	12	6	9	9	11.5	11	15
Paper	1	2	2	2	2	2	1
Painting	17	20	18	19	19	19	14
Chemicals	7	4	4	4	7	7	6
Petroleum	5	17	10	12	4	6	4
Rubber	9	11	5	6	3	4	9
Leather	18	5	19	7	15	17.5	16
Stone, clay, glass	8	8	7	10	8	8	7
Metals	6	14	14	13.5	13.5	12	3
Metal fabricating	10	7	6	5	5	3	11
Non-electrical machinery	16	12	15	13.5	10	10	20
Electrical machinery	4	3	3	3	6	9	5
Transport equipment	12	10	16	11	13.5	14	12
Instruments	15	13	8	15	9	5	18
Miscellaneous	19	18	17	18	17	13	17

*Identical fractional rankings indicate ties; e.g., two industries ranked 13.5 tied for thirteenth place. Rankings were determined before rounding of the data in Table 4.2.

can indicate skewness in the underlying distributions. This is because all our diversity indexes are bounded from below, whereas they are unbounded from above or seldom actually display values close to their upper limits.

COMPANY SIZE AND DIVERSIFICATION

A company's output diversity is almost certainly related to its size. If each activity can be carried out efficiently only at some minimum scale, a company cannot undertake numerous activities without becoming larger than the smallest efficient single-product companies. Yet diversity is also related to the company's share and position in its principal market. Leading enterprises in Canada tend to be less diversified than leading enterprises in the larger U.S. economy, yet industrial establishments of a given size in Canada are more diversified than like-size establishments in the United States.[14]

From the Dun & Bradstreet tape we could secure several indicators of the size of each company. The first is simply:

<u>NE</u> Number of employees at all manufacturing establishments classified to the company.

<u>NE</u> omits employees in those establishments not primarily engaged in manufacturing, although they belong to a manufacturing enterprise; it includes employees in manufacturing establishments not engaged in manufacturing activities. Nonetheless, it is probably a good measure of scale of a company's manufacturing activities.[15] We included both employment and its squared value as factors explaining diversification. Output diversity is not likely to increase linearly with a firm's size, and we generally expect a positive relation between diversity and <u>NE</u> and a negative relation between diversity and $\underline{NE}^2$.

Because many manufacturing processes are subject to different locational pulls and/or technically incompatible within the same plant, we expect output diversity to be positively associated with

<u>NP</u> Number of manufacturing establishments controlled by the company and reported in the Dun & Bradstreet file.

Like the number of employees, the number of plants is not a cause of diversification so much as a possible correlate of the degree of diversity chosen by the firm. With <u>NE</u> controlled, our hypothesis of a positive relation between diversity and <u>NP</u> amounts to a prediction that the more diversified of two equal-size firms will choose to carry on its activities in more plants. If the hypothesis holds, we have some support for the hypothesis that a company faces increased marginal costs of coordination when it expands the lines of output produced in a plant.

A final variable included in the analysis is

<u>FD</u> Dummy variable; it equals one if the company is a subsidiary of a U.S. parent, zero otherwise.

American parentage can be identified from the code numbers assigned to companies by Dun & Bradstreet; unfortunately, subsidiaries of enterprises based in other foreign countries cannot be thus identified, and so FD is a faulty indicator of a company's status as the subsidiary of a multinational enterprise. Economic theory and statistical evidence both suggest that a multinational subsidiary will be more diversified than an otherwise comparable company of domestic ownership.[16] This is because the incremental cost of installing an additional activity is reduced for a subsidiary if its parent already carries on the activity elsewhere and can provide it with know-how and associated intangibles at a lower cost than they can be secured by an independent firm. In the present analysis we can test the hypothesis while imposing a more effective control for differences in company size than has previously been possible.

These hypotheses about diversity and company characteristics should ideally be tested on firms within an industry, to control for base industries' differing potentials for diversification. However, not enough Canadian companies represented in our D&B data fall into individual, narrowly defined industries to permit such a test, and so we control for our companies' primary or base industries crudely by assigning them to the 20 two-digit families in the U.S. Standard Industrial Classification. Only one of these industries, tobacco, was represented by too few firms to carry out a regressio analysis. For the other 19 we regressed each of the six company-specific diversity measures defined above on NE, NE^2, NP, and FD. DE3 and DE4 were each subtracted from one; their complements, VDE3 and VDE4, are used as dependent variables.

The resulting 114 regression equations are summarized in Table 4.4, which reports the sign of each regression coefficient and whether it proved statistically significant at the 5 per cent level. Because all six diversity measures behave in rather similar fashion, the general pattern is easy to summarize: the coefficients of NE and NP are usually positive and significant, the coefficient of NE^2 negative and significant, and the coefficient of FD positive and not statistically significant. Table 4.5 aggregates over the six diversity measures to summarize how the coefficients of the independent variables are distributed between positive and negative signs, significant and insignificant.

The coefficients of NE and NE^2 take opposite signs in all but three of 114 regressions, and in those three neither is significant. The only sector for which NE^2 regularly takes a positive sign is petroleum (29), in which the number of companies is relatively small. For diversity measure NS which we noted tends to emphasize the diversity of large companies, the coefficient of NE is negative and that of NE^2 positive for four other sectors, but that pattern prevails for no other measure of the diversity of any of these four industries. Therefore we conclude that the general pattern is for diversity to increase with the size of companies, although at a diminishing rate.

The number of plants is a quite robust and significant influence on diversity, even though it is surely collinear with NE so that the standard errors of both variables' coefficients are inflated. NP is a more significant influence on the NS measure of diversity than any of the others, consistent with the measure's emphasis of diversity in large (and more likely multiplant) companies.

Table 4.4

SIGN AND STATISTICAL SIGNIFICANCE OF REGRESSION COEFFICIENTS OF DIVERSITY, MEASURES

OF SIZE OF ENTERPRISE WITHIN TWO-DIGIT INDUSTRIES

		20 Food	22 Textiles	23 Apparel	24 Wood	25 Furniture	26 Paper	27 Printing	28 Chemicals	29 Petroleum	30 Rubber	31 Leather	32 Stone, Clay, Glass	33 Metals	34 Metal fabricating	35 Non-electrical machinery	36 Electrical machinery	37 Transportation equipment	38 Instruments	39 Miscellaneous
NS	NE	+	+*	+*	+*	-	+*	+	+*	-*	-	+*	-	+*	+*	+*	+*	+*	-	+*
	NE^2	+*	-*	-*	-*	+	-*	-*	-*	+	+	+*	+	-*	-*	-*	-	-*	+*	-*
	NP	+	+*	+*	+*	+*	+*	+*	+*	+*	+*	-	+*	+*	+*	+*	+*	+*	+*	+*
	FD	+	-*	-	+	-	+	+	+	-	+	+	-	+	+*	-	+*	+*	+*	-*
VOE4	NE	+	+*	+*	+*	+*	+*	+	+*	-	+	+*	+	+	+*	+*	+	+	+	+*
	NE^2	-*	-*	-	-*	-*	+*	+	+*	+	-*	-	-	-*	-*	-*	-*	-	-	-
	NP	+*	+*	+	-	+*	+*	+	+*	+	+*	+	+*	+*	+*	+*	+*	+*	+*	+
	FD	+	-	+	+	-	+	-	+*	-	+	-	+	+	+	+	+	+	+	-
VOE3	NE	+'	+*	+*	+*	+	+*	+	+*	-	+	+	+	+	+*	+	+	+*	+	+
	NE^2	-	-4	-	-*	-	-*	-	-*	+	-*	-	-	-*	-*	-	-	-*	-	+
	NP	+*	+*	+	-	+	+*	+*	+	+	+*	-	+*	+*	+*	+*	+*	+*	+*	+
	FD	+	-*	-	+	-	+	-	+*	-	+	+	-	+	+	+	+	-	+	-
DH	NE	+*	+*	+*	+*	+*	+*	+	+*	-	+*	+&	+	+	+*	+*	+	+	+	+*
	NE^2	-*	-*	-	-*	-*	-*	-	-*	+	-+	-*	-	-*	-*	-*	-*	-	-	-
	NP	+	+*	+	+	+	+*	+*	+*	+	+*	-	+*	+*	+*	+*	+*	+*	+*	+
	FD	+	-+	+	+	-	+	+	+*	-	+	-	+	+	+	+	+	+	+	-
DC	NE	+	+*	+*	+*	+	+*	+	+*	-	+	+	+	+	+*	+*	+	+	+	+
	NE^2	-*	-*	-	-*	-	-*	-	-*	+	-*	-	-	-*	-*	-	-*	-	-	-
	NP	+*	+*	+	+	+	+*	+	+*	+	+*	-	+*	+*	+*	+*	+*	+*	+*	+
	FD	+	-*	+	+	-	+	-	+*	-	+	-	-	+	+	+	+	-	+	-
DW	NE	+	+*	+*	+*	+	+	+	+*	-	+	+	+	+	+*	+	-	+	+	+
	NE^2	-	-*	-	-*	-	-*	-	-*	+	-	-	-	-*	-	-	-	-	-	-
	NP	+*	+*	+	+	+	+*	+	+*	+	+*	-	+*	+*	+*	+*	+*	+*	+	
	FD	+	-+	+	+	-	+	-	+*	-	+	+	-*	+	+	+	+	-	+	-
Number of Companies		224	112	165	169	88	83	90	159	21	63	35	86	83	174	205	169	107	42	69

*Statistically significant at 5% (one-tailed test).

Table 4.5

Summary of signs and significance of regression coefficients of diversity measures on four independent variables

Independent variable	Number of regression coefficients			
	Positive		Negative	
	Significant	Not significant	Significant	Not significant
NE (number of employees)	53	50	1	10
NE^2 (number of employees squared)	1	11	58	44
NP (number of plants)	80	27	0	7
FD (foreign subsidiary)	9	63	7	35

Although a company's status as a subsidiary of a U.S. enterprise generally increases its output diversity, the relation is usually not significant statistically. Thus, a considerable amount of the subsidiaries' apparently greater diversity of output may be due to their relatively large size. Nonetheless, subsidiary status exhibits a significant positive influence on diversity in sectors where foreign-controlled companies account for large proportions of sales: chemicals, metal fabrication, electrical machinery, and instruments. Negative signs appear in industries hosting relatively little foreign investment, with the substantial exception of petroleum.

There is a somewhat complex relation between the variation of diversity with scale, explored in Table 4.4, and the average diversity of sectors indicated in Tables 4.2 and 4.3. In some sectors the average level of diversity is high, but the relation between diversity and size of company is not very close (regression coefficients are relatively small and tend to be insignificant): food and electrical machinery. Technical characteristics of these product groups and their channels of distribution probably tend to make all companies engaged in them diversify somewhat, so that diversity does not strongly increase with company size. By the same token a weak relation of diversity to size goes with a low average level of diversity in other sectors (apparel, printing, petroleum, and leather) where no firms tend to be particularly diversified. The industries in which the diversity-size relation is strong and significant include both those in which the average level of diversity is high (paper, and to a lesser degree chemicals and metal fabrication) and those in which it is on the low side (textiles, nonelectrical machinery). The latter industries are ones in which the technical bases for diversity are relatively weak but the larger firms find it profitable to plow their retained earnings into diversification rather than into expansion of their primary activities. Behavioral factors like these will be taken up in the next chapter, which presents an interindustry regression analysis of the determinants of diversification.

NOTES TO CHAPTER 4

1. This point, and the preceding analysis in general, are developed more fully in Caves (1975, Chap. 2).

2. See Conklin and Goldstein (1955), pp. 15-36.

3. Caves, *op. cit.*, Chap. 3.

4. Gort (1962) for example.

5. Berry (1971), pp. 371-83.

6. For simplicity, the program for computing *DC* did not eliminate duplications; each pair is counted twice, *i* with *j* and *j* with *i*.

7. Some other properties of the indexes *DH*, *DC*, and *DW* are developed in Caves *op. cit.*, Chap. 4.

8. The symbol *I* added to the variable names indicates that they have been aggregated to the industry level.

9. Daly, Keys and Spence (1968).

10. Caves, *op. cit.*, Chaps. 4-6.

11. The rank correlation between *DE3* and *DE4*, 0.692, is lower than the rank correlations between a number of other pairs of measures. The highest rank correlations are between *DH* and *DE4* and between *DC* and *DW*--a result that accords with similarities in the construction of these pairs.

12. Gilbert (1971), Chap. 3.

13. The food sector also ranks high by *NS*, but the cause is probably the relatively fine subdivision of the U.S. standard industrial classification in this sector.

14. Caves, *op. cit.*

15. Sales would be a better measure, obviously, but it is not included in the Dun & Bradstreet data.

16. Caves, *op. cit.*, Chap. 5.

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Chapter 5

CAUSES OF DIVERSIFICATION

R.E. Caves

DETERMINANTS OF DIVERSIFICATION: THE STATE OF KNOWLEDGE

Empirical evidence on the causes of output diversity and theoretical guidance for identifying them are both in scarce supply. We know that the process of diversification by large U.S. companies goes back a half-century; initially it represented a response to their attainment of dominant positions in the national markets for their primary outputs.[1] This historical process, which has proceeded with a good deal of continuity,[2] shows a trend away from diversification into products involving similar production techniques or raw materials and into those involving similar research and development, distributive outlets, or managerial skills.[3] One expects a negative relation between firms' levels of diversification and vertical integration,[4] and Gort found this relation to hold weakly for large companies.[5] Vertical and diversifying expansions compete for funds in the short run, but there are also long-run ways in which they tend to substitute for each other in the long run. Diversification and foreign investment are also competing activities, for related reasons, and the diversity of U.S. multinationals in their domestic product markets have been found inversely related to the extent of their foreign investment in Canada.[6]

Diversification seems to be related in a complex way to the rate of growth of demand in both the diversifying company's base industry and the industries it enters. A firm's growth can be speeded by diversification, of course, so the causation runs both directions; Berry found a positive relation between companies' growth and their diversification when diversity was measured on a "close to home" basis, though not when measured so as to stress migration to distant branches of the Standard Industrial Classification tree.[7] There is a clear tendency for companies to enter industries where demand and production are growing relatively fast,[8] and some evidence indicates that outbound diversification is likely to be heavy from industries that are oligopolistic and slow-growing;[9] the mechanism behind this result is an inclination of firms in such settings not to plough their profits into expansion in their base market (which will entail a fight over market share); but rather to arbitrage their retained earnings into other industries.

A previous study of output diversity in Canadian manufacturing used the indexes of diversity that were presented in Chapter 4 to measure and explain the output diversity of subsidiaries of U.S. multinationals operating in Canada and of establishments belonging to domestically owned enterprises.[10] Weak evidence was found that diversity occurs where technical conditions of production signal a relatively low marginal cost to adding products to a plant's outputs, and weaker evidence still that vertical integration and diversification are competing paths of expansion at the plant level. Output diversity in Canadian plants proved to be related to output diversity in their U.S. counterpart industries, showing that diversity is affected by industry-specific forces that transcend national boundaries.[11] Diversity was also found to be related to the prevalence of nonproduction workers in an industry's labor force.

The researcher does not approach the task of explaining diversity aglow with optimism. Measured at the industry level, diversity reflects technical complementarities that are buried in the technology of production and distribution, and the tools of economic analysis are ill-suited to dig them out. Also the decision to diversify often rests on factors specific to the diversifying company but not characteristic of all firms in its industry. For that reason our analysis proceeds from industry-level data to data on the diversity of a sample of large companies. Even here, we cannot expect our explanation to prove very powerful. Observers credit much of the fad for diversification of the 1960's to the desire of some corporate managers to maximize growth, perhaps at the expense of long-run profitability; the prevalence of such motives cannot be directly tested, and our hypotheses about diversification generally rest on the assumption that companies diversify in order to maximize expected profits or avoid risk, but not to maximize growth. Diversity can result from the buyer's finding a bargain in the market for corporate control, an unpredictable event. It can also result from short-run conditions that are affecting the firm at the time it diversifies but that leave no trace when one subsequently studies the diversity it has achieved; an example is unused debt capacity.

CAUSES OF DIVERSITY: INDUSTRY DATA

With these caveats we turn to the factors explaining industries' output diversity. On the basis of Chapter 4's analysis, one variable that must be controlled is differences between industries in companies' sizes. Some industries' outputs may be more diverse than others simply because they are populated by larger firms that diversify more. Our control is a slightly devious one constructed in light of the results of Chapter 4. There we found diversity to increase with the number of a company's manufacturing plants, even after we controlled for its total number of employees. Therefore our control is the average size of establishments classified to the industry, measured by value added, multiplied by the employment-weighted average number of plants per company. These variables, designated VPE and NPC respectively, are defined more fully in Appendix A. Thus we use the variable

$$\text{ENTR} = \text{VPE*NPC}$$

Because NPC is an employment-weighted measure of multiplant operation, it will vary among industries more than an unweighted average if the multi-plant companies have larger plants than single-establishment firms, as is likely.

The variables that can potentially explain diversification outward from an industry, once we have controlled for company size, deal mainly with competitive conditions and the rate of return to resources allocated to expansion within the primary activity. A company is more likely to diversify when it is profitable and faces a downward-sloping demand curve in its primary activity, so that funds are available for expansion, but the base industry is not an attractive site. The presence of seller concentration is a necessary condition for this situation. Several measures of concentration are available in our data base. The one that proved most effective here and in other uses is a product of two terms. One term is either the conventional four-firm or

eight-firm concentration ratio, C468 or C868. The other is the coefficient of variation of the sizes (shipments) of the largest eight firms, CVC. Our measure of concentration is either

C4CV = C468*CVC, or

C8CV = C868*CVC

The theoretical rationale for this variable is that it reflects both the share of sales held by the largest companies (a large share held by the dominant group being necessary for the effective recognition of their mutual interdependence) and the presence of dominant firms within this group (thought to ease the coordination of rival sellers' decisions). The more familiar Herfindahl coefficient of concentration also reflects both the number and size distribution of sellers, but it gives more weight than our measure to the share of the largest firm and less to the share of the leading group (four or eight firms).

However, concentration is a sufficient condition to encourage diversification only if other conditions are also present. One of these is slow growth. We measure growth (GSI) as the logarithmic growth rate of industry shipments over the years 1961-71. Since the shipments' values are not deflated for price changes, the variable will reflect interindustry differences in price trends as well as the real volume of activity. (There are some grounds for preferring a measure of the growth of industry profits, but it cannot be constructed for a long enough period of time.) Concentration and growth in the base industry should affect diversification jointly. In an unconcentrated and slow-growing industry there are no profits to plough into diversification; in a concentrated and fast-growing industry the profits are devoted to expansion in the base activity. We expect slow growth to encourage diversification only in concentrated industries, and so we employ the variable CGSI, which equals GSI when C468 exceeds 50.0 and is zero otherwise.

Another feature of the market's structure that should interact with these is its access to international markets. The industry selling an undifferentiated product profitably on an international market faces no downward sloping demand curve if, as is likely, the Canadian industry accounts for a relatively small fraction of world production. Our measure of exports is one that nets them against imports, because in industries marked by heavy product differentiation most industrial countries, Canada included, exhibit substantial volumes of both imports and exports. Exporters based in such industries can still face downward-sloping demand curves on world markets, and so a net measure "writes down" the significance of exports in industries subject to extensive two-way trade. Formally, we employ

NEXP = EXP - (IMP/(1 + IMP - EXP))

where EXP is exports as a fraction of domestic shipments and IMP is imports as a fraction of domestic shipments. The denominator of IMP in the definition of NEXP converts it to imports as a fraction of domestic disappearance. We expect NEXP to be negatively related to diversity, from considerations of market competition and the use of resources for diversification. However,

a positive sign is not out of reason on other grounds. Companies may view export markets as riskier than domestic markets because of the uncertainties of exchange-rate changes and government interventions. Diversification can evidently serve the goal of avoiding risk, in which case *NEXP* might turn out positively related to diversity.

The effect of foreign trade, like growth, is probably not independent of the level of concentration. Export status is positively correlated across Canadian industries with both size of enterprise and level of seller concentration, especially the former. If concentration measured in the Canadian market overstates the effective level of concentration in the markets faced by exporting industries, and if export status itself does not induce diversification to spread risks, there should be a negative interaction between concentration and exports. We formed the variable CVEX = C4CV*EXP to detect this interaction.

The variables to be considered next deal not with competitive conditions in the base industry but with other sources of difference in the relative payout to diversification. We noted above that vertical integration tends to be an alternative to conglomerate diversification. We can make only a rough test of that hypothesis because our indexes of diversification do not distinguish between conglomerate and vertical expansions from a company's primary activity, so long as both are represented by different numbers in the Standard Industrial Classification. The only available measure of vertical integration is a very rough one: value added in the industry as a percentage of sales (VRT). There is a built-in positive relation between VRT and our diversity indexes because some vertically integrated activities will be counted as diversifications. Hence even an insignificant negative relation would lend some support to the hypothesized inverse relation between vertical integration and nonvertical diversification.

Another factor that may indicate a low pay-out to diversification is a high level of advertising in the industry's base activity. Many companies apply a brand name to a line of products and advertise them jointly, but these product lines nonetheless usually fall within a single four-digit industry, and thus do not register as diversified in our indexes. The intangible assets of companies that advertise heavily do not seem to transplant readily to remote branches of the SIC tree. A more likely form of diversification for successful companies in high-advertising industries is foreign investment, which has been found closely associated with rates of advertising outlay.[12] Hence, we expect a negative relation between diversity and advertising as a fraction of industry sales (*ADI*).

A final indicator of an industry's prospects for diversification is whether or not its markets are regional. A company that operates in a single regional market may have poor access to national capital markets, and thus be discouraged from diversifying. A company that operates in a number of regional markets is already diversified to the extent that the profit prospects in these regions are imperfectly correlated, and the risk-spreading value for it of product diversification is reduced. Hence we expect diversity to be reduced if an industry's markets are judged to be regionally fragmented in Canada (REG is therefore a dummy variable equal to one for regional industries, zero otherwise).

We have alluded to risk aversion as a motive for diversification. The modern theory of portfolio management spins a complex set of relationships around diversification by the firm. First of all, if diversification were costless to the shareholders of firms in the Canadian economy, they would pay no premium for claims on a firm's income because it offered an earnings stream that had been stabilized through diversification; the shareholders could freely diversify their own portfolios, and therefore might even penalize a firm for reducing its diversifiable risk. If transaction costs restrict the diversification by shareholders, however, this conclusion disappears (see Chapter 9). Furthermore, diversification by a large company may reflect risk aversion by its management, who work only for that company and cannot otherwise diversify the risk that the firm's fortunes and misfortunes pose for their own utility. Under various reasonable assumptions, therefore, the firm will place a positive value on diversification to reduce risk. The payout in risk reduction from particular diversifications depends on the covariance of profit prospects between the base and diversifying activities.

For the company making a long-run investment decision this expected covariance encompasses the effect on the two activities of a wide variety of disturbances: recession, inflation, changes in technology or input prices, and so on. This subjective covariance is difficult to investigate empirically. Our principal attempt comes in Chapter 6, where we can take account of both the industry of origin and the industry of destination for the diversifying company. Here we are limited to hypotheses about the riskiness of an industry for the firms based in it as an incentive for diversification. We have already mentioned that exporting could be viewed by managers as risky, and hence positively related to our diversity indexes. We also have measure of the intertemporal variation of sales in our sample of industries. In exploratory analyses, however, no measures of the variability of an industry's activity displayed any regular relation to diversification, and so they are omitted from the regression equations reported below.

In Table 5.1 we present regression equations of several of our diversity indexes on the independent variables defined above: DHI, SPL, and VDE3I (which equals one minus DE3I). The results for DCI and DWI generally resemble those for DHI but are a little weaker; those for NSI resemble SPL, and DE3 and DE4 turn in a similar performance. As the results of Chapter 4 suggest, ENTR is positively related to each diversity measure, although the level of statistical significance is not particularly high. ENTR is collinear with the measures of concentration, as one would expect, because the data base, dependent as it is on the Standard Industrial Classification, contains no concentrated industries populated by small companies. Standard errors are therefore inflated for both ENTR and the variables measuring or including measure of seller concentration. ENTR is more significant as a determinant of SPL (and NSI) than the other indexes; this result confirms the conclusion of Chapter 4 that these indexes tend to register proportionally more diversity for large companies.

The concentration measure C4CV is used in the equations reported in Table 5.1; its performance is essentially identical to that of C8CV. The variable is always positive and its coefficient exceeds its standard error in

Table 5.1

Regression analysis of determinants of diversification, industry data*

Independent variable	Dependent variable				
	DHI	SPL	DHI	DHI	VDE3I
	(1)	(2)	(3)	(4)	(5)
ENTR	0.00108[b] (1.807)	0.08329[a] (2.859)	0.00087[c] (1.347)	0.00109[b] (1.802)	0.00075[b] (1.953)
C4CV	0.00104 (1.104)	0.03248 (0.706)	0.00015 (0.169)	0.00055 (0.516)	0.00011 (0.165)
CVEX	-0.00527[b] (-2.145)	-0.08704 (-0.728)		-0.00526[b] (-2.165)	-0.00381[a] (-2.452)
NEXP			-0.16438 (-1.038)		
VRT				-0.18400 (-0.910)	-0.12740 (-0.988)
CGSI				0.53874 (0.713)	0.89780[b] (1.865)
ADI	-0.00916 (-0.860)	-0.78704[c] (-1.518)	-0.00585 (-0.542)		
REG	-0.09773[c] (-1.557)	-0.49227 (-0.161)	-0.07328 (-1.107)	-0.09025[c] (-1.397)	-0.03463 (-0.841)
Constant	0.4258 (7.968)	10.32 (3.967)	0.4068 (6.829)	0.4993 (4.354)	0.3518 (4.813)
R^2	0.055	0.107	0.005	0.053	0.103
F	1.83	2.71	1.08	1.66	2.36
Degrees of freedom	66	66	66	65	65

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom.

some specifications, but we cannot say that a significant independent influence of concentration on diversity has been found. The interaction between concentration and exports (CVEX), however, is negative and significant, although the influence of net exports themselves is negative but not significant for DHI and the diversity indexes similar to it.[13] The significance of C4CV drops sharply in equations containing NEXP and omitting CVEX. We conclude that concentration probably has a positive influence on diversification where other conditions are favorable, and exports a negative one, but the statistical results are not clear-cut.

Growth is another variable that affects diversity in an interactive way, according to the hypotheses developed above. The results in Table 5.1 contain a surprise, however, because CGSI turns out to be positive and, indeed, weakly significant for VDE3I (a two-tailed test is appropriate). (GSI, not shown in Table 5.1, is also positive more often than not, but quite insignificant.) There are many examples of well-known conglomerate companies diversifying out of slow-growing industries. However, overall it may be relevant that too slow growth deprives companies of profits available for diversification, even out of concentrated industries. For the moment we draw no conclusions about the relation between growth and diversification, but a stronger test is applied in the next section.

In equations 4 and 5 vertical integration (VRT) characteristically shows a negative relation to diversity with a standard error about the same size as its regression coefficient. Because none of our diversity indexes can distinguish between vertical integration and diversification, there is a built-in bias toward a positive relation, and this formally insignificant negative one should probably be given a certain credence. Advertising (ADI) is always negatively related to diversity, and the relation is weakly significant in the case of SPL.[14] The expected negative relation between diversity and regional status for an industry (REG) is also confirmed.

In conclusion, we stress that the explanatory power of the equations in Table 5.1 is very low, and only equations 2 and 5 are significant overall on the basis of their F ratios.

CAUSES OF DIVERSITY: COMPANY DATA

We now turn to analyze the diversity of large companies, with slightly higher hopes. The diversity of all companies in an industry reflects both technical factors that we can model poorly if at all, and competitive factors for which economic theory is a more suitable instrument. The importance of the latter is surely modest for the smaller companies whose diversity is encompassed in our industry-wide measures, but should emerge more strongly for large companies that tend to operate in relatively concentrated industries and to dominate those industries. Furthermore, some causes of diversification are company-specific and for that reason cannot be captured at the industry level.

The resources of our data base offer some important opportunities for testing the determinants of companies' output diversity. The indexes of output diversity described in Chapter 4 were calculated for each of the 125 manufacturing enterprises in our data base and can be related to the

income-statement and balance-sheet variables also available for those companies. But we shall also employ variables describing conditions in the base industry to which each company is assigned, and in a weighted average of all industries in which it is active (the weights being the employment in its manufacturing establishments assigned to each industry--see Page 5 We shall build on and add to the hypotheses developed in the preceding section.

THE VARIABLES

Competitive conditions are particularly likely to affect the diversificatior of large companies that hold substantial market shares, and so we use C4CV the concentration measure that provided the most explanatory power (though still a modest amount) above (page 115). The implications of this variable and its interactions, however, will be developed in a different way.

One question about concentration concerns the relation between the market structure of the company's base industry and the industries into which it diversifies. Does a company that has succeeded in a moderately concentrated market use its position there as an operations base for an assault on the entry barriers surrounding a more concentrated market? Or does the successful operator in a highly concentrated industry market diversify into less concentrated industries, seeking to spread its risks and earn profits equal to the marginal (if not the average) rate of return it achieves in its base industry? We hope to answer this question by relating diversity to

DCR4 = WC468 - C468.

where WC468 indicates (as the W prefix always does) an employment-weighted average of the industries in which the company participates. We are uncertain what sign to expect for DCR4. The questions about the sign may be somewhat resolved if we also examine the difference between the average size of all establishments in the company's base industry and all industries in which it participates

DVPE = WVPE - VPE

If the sign of DVPE is negative, it would seem that large companies diversify into industries and are of smaller scale but that nonetheless may impose capital-cost entry barriers on newly organized firms.

Consider the relation between diversity and exposure to international trade. Although positive partial relations should exist between both concentration and diversity and exports and diversity, we found a significant negative interaction between them in the industry-wide data. That interaction can be tested for companies as well and should hold for all the industries in which the company participates, not just the base industry. Therefore we employ a version of CVEX constructed from each firm's weighted industry variables (indicated by the prefix *W*)

WCVEX = WC468*WCVC*WEXP

We can now test directly the hypothesis that heavy exporters diversify to avoid risk by examining the difference between the weighted average of exports as a percentage of shipments in all their industries and in their base industry:

DEXP = WEXP - EXP.

In Table 5.1, we found no relation between the rate of growth of an industry's shipments and the diversification of companies classified to it; when the growth rate was interacted with concentration, we secured a positive result. The question can be probed further if we employ the variable

DGSI = WGSI - GSI,

the difference between the growth rate of the company's weighted-average industries and its base industry. A positive sign indicates that a company diversifies to gain access to faster-growing sectors of the economy. A necessary condition for such diversification is that the firm have a cash flow sufficient to support this diversification. We cannot examine the company's own profit rate as a factor explaining its diversity because the causality surely runs both ways. However, the same objection does not hold for industry profits, and we can test the hypothesis that companies are more likely to diversify for faster growth out of profitable industries. We employ the interaction

PRGR = ROI*DGSI,

where ROI is the average profit rate of the company's base industry (taken only for industries with ROI>0).

Another often proclaimed motive for diversifying, similar to the quest for growth, is to enter into industries with advanced technology. We lack a variable that is really suitable to detect this motive, but in a rather coarse test we can examine the differential between nonproduction workers as a fraction of total employees in the company's weighted-average and base industries:

DNPW = WNPW - NPW.

Out of the largely negative conclusions of the section beginning on page 114, the suggestion that a company's diversity may be largely the idiosyncratic result of its history and not the reflection of sustained and systematic forces in the economy. Therefore we include among the variables explaining each firm's diversity the value assigned to that same diversity index in its base industry. If the company's diversity were totally characterized by that of its industry, of course, this variable would crowd out all the other independent variables. On the other hand, it may also serve to remove industry-specific forces not captured by our analysis, or industry-specific biases created by our particular methods of measuring diversification.[15]

Earlier, we tested several other industry-specific influences on diversity, with unimpressive results. Only the hypotheses that advertising outlays are negatively related to diversification seems worth retaining in the present analysis, and so the variable ADI (advertising-sales ratio in the company's base industry) is included. Because we are now dealing with

large and frequently diversified companies, it also seemed appropriate to include diversification by other companies into their base industry as a possible determinant of their own diversification out of that industry. The measure, OWN, is the fraction of the base industry's value added accounted for by establishments controlled by companies operating primarily in other industries.

Three variables among the company data available to us seemed likely to reflect causal influences on diversification (and not themselves to be dependent on diversification to a crippling degree). One of these is FFS, the company's average ratio of noncurrent assets to sales. A company that is capital-intensive in this sense faces risks from profit-reducing disturbances to its base industry to the extent that its noncurrent assets are also durable. Related to this, we also include the company's average ratio of net to gross assets (NGA), a conventional if rough measure of the newness of its depreciable assets. If variations in NGA mainly reflect the assets used in the company's base industry, a low value means that much of its cumulative past investments in that industry have been disengaged by depreciation and made available for other uses, including diversification. NGA thus indicates (inversely) a circumstance that facilitates diversification, though does not cause it unless other conditions are present.

It is also tempting to examine the relation between diversification and the company's exposure to risk in its base industry, yet this relation is elusive because company-wide measures should themselves reflect the influence of diversification. But the statistical result itself can help settle the issue. We expect base-industry risk to promote diversification (subject to the qualification mentioned on page 117), and that diversification will reduce the overall risk-exposure of the firm. Our company-specific measures of risk reflect the company's overall situation. If they should be positively related to its diversity, we should have a rather strong test of the causal influence of risk on diversity, because the effect of diversity on risk tends to produce a negative regression coefficient. If the coefficient in fact turns out to be negative, no conclusion about the influence of risk is possible. The measure that we employ is SDP, the standard deviation of annual net income for 1961-74 (or whatever shorter period is available) around a trend-line regression on time.

THE RESULTS

The results of this regression analysis appear in Table 5.2. It is useful first to contrast equations 1 and 5 with 2 and 6, which are identically specified except for omitting the industry diversity variable, DHI. DHI itself explains much of the variance of the firm's own diversity index, DH; the beta coefficient of DHI in equations 1 and 5 is about 0.55.[16] Therefore, we expect DHI to clarify the statistical significance of any other independent variables that affect the diversity of large companies but not their industries, but it may conceal the significance of any influences that affect diversity in the industry at large and not just in its leading firms. Variables that apparently fall into the second class are seller concentration (C4CV) and the interaction with exports (WCVEX). However, differential concentration between the base industry and the overall mix of the company's industries approaches significance only when DHI is included; apparently the tendency

Table 5.2

Regression analysis of determinants of diversification, company data*

Dependent variable		Independent variables														Constant	R^2	Degrees of freedom
		DHI	C4CV	OWN	ADI	WCVEX	DEXP	DCR4	DVPE	DGSI	DNPW	PRGR	FFS	SDP	NGA			
1.	DH	0.8269[a]	0.0003		-0.0323[b]		0.0175			5.1486[b]			-0.0034	0.0542	-0.3002[c]	0.2376	0.358	71
		(5.72)	(0.40)		(-1.95)		(0.05)			(1.76)			(-0.05)	(0.36)	(-1.32)	(1.70)		
2.	DH		-0.0013[b]		-0.0284[b]		-0.4624			4.7859[b]			-0.0601	0.0942	-0.1182	0.6475	0.094	104
			(-1.67)		(-1.69)		(-1.27)			(2.02)			(-0.88)	(0.56)	(-0.54)	(5.74)		
3.	DH		-0.0014[c]	0.0013	-0.0281[c]		-0.5486[c]	-0.0032				3.6855[c]	-0.0648	0.0980	-0.0550	0.5992	0.081	102
			(-1.64)	(0.71)	(-1.66)		(-1.48)	(-0.94)				(1.38)	(-0.93)	(0.57)	(-0.24)	(4.70)		
4.	VDE4		-0.0011[c]	0.0017	-0.0218[illegible]		[illegible]	[illegible]				[illegible]	[illegible]	0.0208	-0.0510	0.4312	0.098	102
			(-1.55)	(1.12)	(-1.50)		(-1.79)	(-0.73)				(1.56)	(-1.02)	(0.14)	(-0.26)	(4.13)		
5.	DH	0.8246[a]		0.0044[b]	-0.0211[c]	-0.0006		-0.0040[c]		6.7740[b]	-0.4990		0.0156	0.1354	-0.2019	0.0984	0.406	69
		(5.54)		(2.38)	(-1.45)	(-0.30)		(-1.30)		(1.31)	(-0.66)		(0.24)	(0.92)	(-0.90)	(0.65)		
6.	DH			0.0027[c]	-0.0360[b]	-0.0058[a]		0.0000		5.0442[b]	-0.2688		-0.0491	0.1880	-0.0530	0.5594	0.127	102
				(1.62)	(-2.31)	(-2.97)		(0.01)		(2.03)	(-0.39)		(-0.74)	(1.11)	(-0.24)	(4.82)		
7.	DH		-0.0003	0.0027[c]	-0.0343[b]	-0.0063[a]			-0.0309[b]	4.9048[b]	-0.4287		-0.0694	0.1254	-0.0350	0.5648	0.155	101
			(-0.41)	(1.55)	(-2.11)	(-2.88)			[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	(-0.16)	(4.61)		
8.	VDE4		-0.0004	0.0029[b]	-0.0271[b]	-0.0046[a]			-0.0231[b]	4.8152[a]	-0.5290		-0.0600	0.0430	-0.0519	0.4335	0.151	101
			(-0.53)	(1.90)	(1.92)	(-2.44)			(-1.79)	(2.39)	(-0.91)		(-1.05)	(0.29)	(-0.28)	(4.08)		

*DVPE and SDP have each been multiplied by 1000 to scale them conveniently.

Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent;

c = 10 percent. R^2 values are corrected for degrees of freedom.

to diversify into less concentrated industries is more characteristic of large companies than of others in their industries. Another difference between equations 1 and 5 and the others is in degrees of freedom: industry diversity indexes are not available for some companies' base industries.

A notable difference between the results for large companies and for industries lies in the negative relation of diversity to concentration in Table 5.2 and the positive (if insignificant) relation in Table 5.1. There may be a statistical basis to this difference. If a large industry is highly concentrated, its leading firms must be either very large or not very diversified. If leading company size increases less than in proportion to base industry size (holding concentration constant), the diversity of leading companies will be negatively related to concentration. Because we have not been able to rule out this interpretation, we put little behavioral weight on the weakly significant negative relation appearing in Table 5.2 and conclude that no simple relation between diversity and concentration has been established. It is notable that the interaction between concentration and exports is significantly negative, confirming a result of Table 5.1. Also, differential concentration (DCR4) is negative, though its coefficient is not significant in most specifications. Considering as well the significant negative coefficient of differential value added per establishment, we conclude that large companies typically expand into industries marked by smaller establishment sizes than their base, and probably as a result with lower concentration.

Another variable bearing on competitive conditions is inbound diversification to the company's base industry (OWN). It is significant in many specifications and always correctly signed. Large companies may diversify as a hedge against the competitive threats posed by the entry of other diversified companies into their base industries. This interpretation is strengthened by the absence of a relation between OWN and industry-wide diversification, which tends to rule out unobserved technical forces that promote firms to diversify both into and out of an industry.

Our hypothesis that companies diversify into faster growing industries is strongly supported by the results for DGSI in Table 5.2. Interacting DGSI with profitability in the base industry does not improve the model's explanatory power (compare equations 2 and 3), so we are left with unclear results about how diversity is related to the absolute growth rate of the company's base industry. Although companies diversify for faster growth, slow growth in the base industry is clearly not a sufficient condition for diversification, nor is growth-seeking diversification clearly dependent on profits in the base industry.

Although exports are a depressant of diversification (variable WCVEX, it is also true that companies seem to diversify to escape the risks of export industries; DEXP is negative and marginally significant in most specifications (but not when the industry diversity variable is included, a result that suggests dominant and follower firms alike use this method of risk avoidance). Advertising regularly shows the predicted negative relation to diversity. More surprisingly, though consistent with the result for ADI the negative sign on DNPW offers no support for the hypothesis that companies diversify to acquire skills possessed by nonproduction workers in other industries;

this negative result may occur because vertical integration is a prominent component of the diversity as we measure it and is not affected by this consideration. Finally, the company-specific variables do rather badly. The profit variance term (SDP) is consistently positive but insignificant. FFS (fixed capital) and NGA (newness of capital stock) turn out to be quite negatively correlated with each other (-0.41); so their influence cannot be disentangled. If they are entered one at a time (giving biased estimates, of course), NGA is significantly negative and FFS insignificantly positive.

The equations in Table 5.2 cover only two of our diversity measures. It does not make much difference which measure is chosen, as can be seen by comparing pairs 3 and 4 and 7 and 8. VDE3 and NS rather resemble VDE4, and DW and DC rather resemble DH. No major conclusion is affected by one's choice of a diversity index, although marginal shifts do occur in levels of significance.

Overall, our ability to explain the diversity of large companies is better than our ability to explain industry diversity. The adjusted R^2 values, though still low, are comfortably higher than those in Table 5.1 without the spurious inflation that results from including DHI.

DIVERSIFICATION INTO AN INDUSTRY

THE VARIABLES

The extent of diversification into an industry raises another set of economic questions. Inbound diversification reflects entry by companies already established in other industries. The dependent variable in the following analysis (OWN) is defined as the proportion of an industry's value added that originates in establishments belonging to companies whose primary activity lies in another industry.

Inspection of the dependent variable's values for our sample of industries reveals a distinctive pattern: high values appear for industries that either sell most of their output to, or buy their chief input from, another industry that is concentrated and has larger firms and establishments than the industry in question. Inbound diversification to such industries in the main represents vertical integration by large enterprises in the adjacent industry. Vertical integration for them would be feasible (because of the smaller scale of establishments in the entered industry) and might carry various advantages.[17] To detect situations ripe for this form of inbound diversification we used a very simple procedure. A dummy variable was constructed, judgmentally designating industries matching these conditions, on the basis of variables in our data base describing seller concentration (C468), the size of establishment (VPE), and the input-output table.[18] The variable is designated VRTD, and should be positively related to OWN.

Because inbound diversification involves entry by established companies, its occurrence should be related to barriers to entry into the industry. Entry impediments for going firms differ from those facing newly organized companies; the going firm is generally better equipped to hurdle entry barriers, but still faces some disadvantage against the standard sources of entry barriers.[19] Our strategy is not to consider the sources of entry

barriers directly, but rather to utilize the proposition that an industry's level of concentration in the long run must reflect the ease of entry: very low concentration should indicate easy entry, very high concentration difficult entry. Entry into highly concentrated industries is thus presumed difficult--for the going firm as well as for the newborn company. We expect low values of OWN in highly concentrated industries. On the other hand, a going firm that considers diversifying will generally not look to an atomistically competitive industry in which no more than a normal competitive profit rate can be expected. The implied nonlinear relation between OWN and concentration can be specified in many ways, and no theoretical guidance is available as to the right one. Experimentally we found the relation between OWN and four-firm seller concentration to be apparently linear up to quite high levels of concentration, then to drop sharply. Therefore we captured the nonlinear relation by entering C468 as a linear variable but adding a dummy variable that took the value of one for industries in which C468 exceeds 90 per cent (HIC4). The sign of C468 should be positive, that of HIC4 negative.

To make sure we had captured the depressant effect of easy entry we also included each industry's average number of working proprietors per establishment (PRB). This variable indicates the prevalence of owner-managed businesses, which surely are at a disadvantage in overcoming the major types of entry barriers. It should be negatively related to OWN. For similar reasons we included the variable IMP, imports as a fraction of domestic production. Other things being equal, close import competition should constrain the potential profit that a market offers to a diversifying firm and reduce the amount of inbound diversification.

The presence of economies of scale may affect an industry's attractiveness to a diversifying company, although the direction of effect is not immediately certain. Our rough proxy for the extent of cost disadvantages to smaller establishments and enterprises is CDRC, which measures value added per worker in the smaller establishments accounting for 50 per cent of industry employment relative to value added in the larger establishments accounting for the other half. If companies that have diversified into an industry generally operate large-scale establishments, their presence should be negatively related to CDRC, which inversely indicates the disadvantages faced by the smaller establishments. Analysis of Statistics Canada data shows that on the average plants belonging to companies classified to other industries are larger than the plants of companies classified to the industry at hand.[20] Therefore we expect a negative relation between CDRC and OWN, because disadvantages facing small-scale companies (or entrants) afford protection to the diversifying firm able to enter at an efficient scale.

We employed some variables to indicate directly the difficulty of diversifying into certain industries. High rates of advertising (as a percentage of sales), if there are any economies of scale in advertising, impose a barrier to the entry of new and diversifying companies alike, and so we expect OWN to be negatively related to ADI (advertising as a percentage of industry sales, 1965). We also employed a measure of the capital cost of entering the industry with an efficient-scale plant. Studies of entry barriers and profitability[21] (e.g. Comanor and Wilson, 1967) have generally shown that the profitability of an industry's incumbent firms increases with the cost of entry for newcomers.

Because the going-firm entrant enjoys an advantage over the newborn firm in raising the capital to enter an industry, the relation of OWN to absolute-capital-cost entry barriers provides a critical test of the hypothesis. We measure these barriers by multiplying the industry assets-to-sales ratio (ATS) by a measure of the minimum efficient scale of production (MESC) in those industries where the disadvantage of small-scale production appears to be substantial.[22] A "substantial" disadvantage is detected by a value of CDRC less than 0.9; thus we define

MES9 = MESC if CDRC < 0.9, zero otherwise.

Our measure of absolute-capital-cost entry barriers, then is

CAP9 = ATS*MES9.

The variable reflects capital-cost barriers of obtaining a large minimum share, not an absolute scale of output.

A common finding about diversification and mergers in the United States has been that companies tend to enter industries with high technological potentials.[23] We lacked a measure of research and development activity or of technical personnel that might roughly designate this attractive force. We sought a rough approximation in WNP average salaries paid to non-production workers. High compensation of these personnel should indicate high skill levels, which would include research personnel but also other sophisticated and flexible skills that might be attractive to diversifying companies. This line of reasoning may suggest that not only the sophistication and skill of nonproduction employees but also their proportional importance in the establishment's activities may affect the decision to diversify. Therefore we also employ the variable nonproduction workers as a fraction of total workers (NPW) in order to construct the variable NPWW = WNP*NPW. This variable reduces to the annual compensation of nonproduction workers divided by total number of employees.

THE RESULTS

The results of OLS regressions of OWN on these variables are shown in Table 5.3. Three variables, C468, H1C4, and VRTD, are formidably significant and by themselves account for 38 per cent of the variance of OWN (after adjustment for degrees of freedom). The coefficient of H1C4 indicates that a four-firm concentration ratio over 90 per cent reduces by more than 20 percentage points the proportion of an industry's value added accounted for by establishments belonging to enterprises based in other industries. Likewise, our dummy for industries suited for entry by vertical integration (VRTD) makes a difference of almost 30 percentage points for this proportion. These magnitudes can be compared to the standard deviation of the dependent variable, which is only 18 percentage points. When PRB is added in equation 2 to capture the effect of easy entry by noncorporate enterprises, it is significant at 5 per cent; however, PRB is (unsurprisingly) negatively correlated with C468 and lowers the significance of that variable somewhat. Equation 1 likewise reveals that import competition (IMP) significantly reduces the amount of inbound diversification.

Table 5.3

Regression analysis of determinants of diversification

into manufacturing industries*

Equation	Independent variables											Degrees
no.	C468	HIC4	VRTD	CAP9	PRB	IMP	ADI	WNP	CDRC	Constant	R^2	of freedom
1.	0.307^a (4.28)	-28.9^a (-4.02)	28.5^a (6.79)	-0.899^a (-2.94)		-8.45^b (-1.84)				5.44 (1.48)	0.484	88
2.	0.240^a (2.96)	-24.6^a (-3.43)	28.3^a (6.60)	-0.808^a (-2.58)	-16.3^b (-1.83)		-0.373 (-0.61)	-2.63 (-1.10)		28.0 (1.62)	0.474	86
3.	0.292^a (3.72)	-25.3^a (-3.46)	29.3^a (6.75)	-0.851^b (-2.11)			-0.299 (-0.48)	-0.728 (-0.32)	0.530 (0.06)	8.29 (0.56)	0.454	86

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent. R^2 values are corrected for degrees of freedom.

The entry-barrier variables work unevenly. CAP9, the proxy for the absolute-capital-cost barriers, is robust and significant. Advertising as a percentage of sales, however, is correctly signed but not significant. Neither WNP nor NPWW takes the expected sign (only WNP is shown in Table 5.3), and both are insignificant; this negative result echoes that for in Table 5.2. CDRC is quite insignificant.

In conclusion, our analysis of inbound diversification has identified one major technical determinant: the potential for vertical integration (or vertical entry) by large-scale enterprises. It has also confirmed a hypothesized nonlinear relation between inbound diversification and concentration. This and our conclusion about capital-cost entry barriers supplement Orr's finding about the effect of entry barriers on actual rates of entry into Canadian manufacturing industries.[24]

NOTES TO CHAPTER 5

1. See Chandler (1962).

2. Gort (1962), pp. 44-48.

3. *Ibid.*, pp. 58-59.

4. Stigler (1951).

5. Gort, *op. cit.*, Chap. 5.

6. Caves (1975), Chap. 4.

7. See Berry (1975), Chap. 4.

8. Gort *op. cit.*, Chap. 7.

9. Gilbert (1971).

10. Caves, *op. cit.*, Chap. 6. The study did not analyse the output diversity of domestically-owned companies, and the sample of subsidiaries was smaller than ideal.

11. That same continuity was found to hold between the diversity levels of subsidiaries of U.S. multinational companies and the diversity of their parents' activities in the United States (*Ibid.*, Chap. 4).

12. Caves (1974).

13. *NEXP* is insignificantly positive for *SPL* and *VDE3I* (equations not shown in Table 5.1), but this sign surely reflects the larger average size of companies in export industries (not fully controlled by *ENTR*).

14. *ADI* is highly correlated with *VRT*, advertising is a purchased service counted in value added.

15. Caves (1975, Chap. 5), found that diversity in plants classified to Canadian industries was significantly related to diversity in plants classified to the U.S. counterpart industry, although relatively few structural influences measures for the Canadian industry proved to be significant determinants of diversity. Deleting the U.S. diversity measure did not improve the significance of the Canadian structural variables.

16. The same close relation holds between other pairs of company and industry diversity indexes. The regression coefficients of company on industry diversity are characteristically smaller than one, though the difference is not statistically significant. Probably this pattern reflects a tendency for a large company's diversity to exceed its base industry's diversity more when the latter is low than when it is high.

17. See the discussion of the reasons for vertical integration in Williamson (1971).

18. Canada, Dominion Bureau of Statistics (1969).

19. Bain (1956), Caves and Porter (1977).

20. We examined all manufacturing industries for which Statistics Canada gives an exact figure for the share of industry value added accounted for by establishments of companies classified to other industries (our variable, OWN). For 65 industries the average figure is 26.1 per cent. But these establishments belonging to companies in other industries account on the average for only 15.6 per cent of the number of establishments classified to the industry. See Statistics Canada (1975), Table 6.

21. Comanor and Wilson (1967).

22. See Caves, Khalilzadeh-Shirazi, and Porter (1975).

23. Gort (1969).

24. Orr (1974).

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Chapter 6

INTERINDUSTRY PATTERNS OF DIVERSITY

A. Lemelin

In the two preceding chapters, measures of output diversity have been proposed and hypotheses tested concerning its causes and effects. The next step, which is undertaken here, is to study patterns of diversity. Is there some regularity in the directions in which firms with the same primary activity choose to diversify? If so, how much can be explained by industry characteristics only? Which economic hypotheses are vindicated?

It is obvious that an exhaustive study of patterns of diversity should consider firm characteristics as well as industry characteristics. Only the latter are taken into account here, to limit the scope of this chapter's study to a manageable breadth, for, as it will become apparent, data and computational requirements are considerable. This is why even if more results had been available for presentation at this time, they would have been essentially exploratory in nature. Strategic choices had to be made, at least provisionally, will little or no justification and promising avenues of research had to be abandoned. Nevertheless, it is hoped that useful preliminary conclusions will be reached that will warrant expending further efforts toward understanding interindustry patterns of diversity.

SUMMARY

This chapter is divided into five parts. The first, "Data on interindustry patterns of diversity", describes the data on interindustry patterns of diversity and offers some descriptive results. The second, "Methodological considerations", displays a "map" of interindustry patterns of diversity. Then, the use of linear regression analysis is justified, and the reader is briefly cautioned concerning its limits in the present context. The following part, "The delineation of samples and construction of a dependent variable", discusses the problem of translating "patterns" into a dependent variable for regression analysis. The "delineation of samples" refers to the question of which sets of observations can be expected to display common patterns: an attempt is made to provide support for some a priori expectations using a Euclidian distance criterion. Next, the part entitled "hypotheses and regressors" translates economic theoretical and "casual empirical" hypotheses into observable variables to be used as regressors. Finally, under "Preliminary specification and first results", a strategy is discussed for regression analyses of the chosen dependent variable against the regressors derived in the previous part.

DATA ON INTERINDUSTRY PATTERNS OF DIVERSITY

The starting point of the analysis is the company output profile (hereafter COP). As described in Chapter 4, the D&B records have been used to assign employees in each of a company's plants to its various products by applying a geometric series to the ranked list of products. The activities of a firm's various plants have then been aggregated to yield its COP. The COP is a row-vector of numbers; there is one number corresponding to each of the 451 four-digit manufacturing codes of the U.S. Standard Industrial Classification (hereafter SIC); each number is the number of the company's employees assigned to the corresponding activity (SIC code).

Needless to say, the limitations of the D&B information on establishment activities, discussed in Chapter 4, are just as relevant here. If anything, perhaps additional caution is called for: whereas in Chapters 4 and 5 the constructed COP's were aggregated to yield measures of diversity, here it is the very breakdown of employment between activities that comes under scrutiny. What is lost is the benefit of the prevailing presumption that imperfections in the data tend to cancel out under aggregation.

In addition if use was to be made of the COP's, it was necessary to arrange for an interface with the general data base. The latter being classified according to the Canadian 1960 three-digit SIC, the COP data were aggregated to a comparable classification. Table A.1 in Appendix A lists the Canadian 1960 three-digit SIC codes found on the D&B tape.[1] In many cases, suitable matches did not exist for D&B codes, so these had to be referred to a residual "other" category, numbered 999. Conversely, there are some Canadian codes to which no D&B code was assigned. The comparable classification has 75 industries, not counting the residual industry #999.

There were at least two ways of aggregating the D&B data on output diversity. One way was to substitute the Canadian for the U.S. code before performing the weighting process that was to assign plant employment to different activities. But replacement of the D&B SIC codes with Canadian codes would have resulted occasionally in the repeated appearance of a given code number in the list of activities of a single plant: it would then have been necessary to decide whether to ignore the second and further mentions of that activity (code) or to give it the sum of weights that it would have been assigned in its different guises under the D&B classification. The second choice, of course, is equivalent to aggregating the COP's themselves, after they have been constructed with the D&B SIC: this, indeed, is the other way to aggregate the D&B data on output diversity. And it is the latter procedure that was adopted because, in terms of the discussion of Chapter 4, the four-digit U.S. SIC, as a system for classifying and subdividing products, has more homegeneity and regularity than the classification used here, which is restricted by comparability considerations, and has a large residual category.

So the original 451-element COP row-vectors were aggregated to 76-element row-vectors. Then, of course, companies' primary activities had to be re-defined:

PC3(I) — Primary activity of company I, determined from its COP as the Canadian 1960 SIC code[2] that accounts for more of the company's employees than any other activity.

Table 6.1 presents a first set of summary variables concocted from the rearranged data on diversity:

(1) SIC — Canadian 1960 three-digit SIC number.

(2) NULT — Number of ultimate firms classified to industry referred to in (1).

(3) ROWEMP — Total employment in all activities of firms classified to industry referred to in (1).

(4) ROWAVG — Average employment in all activities of firms classified to industry referred to in (1): (4) = (3)/(2).

(5) ROWSTD — Standard deviation of employment in all activities of firms classified to industry referred to in (1).

(6) OWNEMP — Total primary activity employment of firms classified to industry referred to in (1).

(7) OWNAVG — Average primary activity employment of firms classified to industry referred to in (1): (7) = (6)/(2).

(8) OWNSTD — Standard deviation of primary employment of firms classified to industry referred to in (1).

(9) OWNROW — Ratio of employment in primary activity to total employment of firms classified to industry referred to in (1): (9) = (6)/(3).

Table 6.2 presents a second set of summary variables concocted from the rearranged data on diversity:

(1) SIC — Canadian 1960 three-digit SIC.

(10) NCOL — Number of firms having some employment in activity referred to in (1), whatever their primary activity.

(11) COLEMP — Total employment in activity referred to in (1), for all firms, whatever their primary activity.

(12) COLAVG — Average employment in activity referred to in (1) of firms counted in NCOL: (12) = (11)/(10).

(13) COLSTD — Standard deviation of employment in activity referred to in (1) of firms counted in NCOL.

(14) OWNCOL — Ratio of primary activity employment of firms classified to industry referred to in (1) to total employment in that same industry by all firms, whatever their primary activity: (12) = (6)/(11).

Table 6.1 Mean and standard deviation of firms' employment (total and primary), as constructed from D&B data on diversity, with firms grouped according to primary activity.

SIC (1)	NULT (2)	ROWEMP (3)	ROWAVG (4)	ROWSTD (5)	OWNEMP (6)	OWNAVG (7)	OWNSTD (8)	OWNROW (9)
103	4	2190.	548.	642.	2079.	520.	654.	0.94921
105	40	14611.	365.	630.	12272.	307.	497.	0.83988
111	20	10347.	517.	559.	9120.	456.	476.	0.88136
123	5	621.	124.	86.	538.	108.	61.	0.86718
128	6	5132.	855.	1334.	3773.	629.	962.	0.73527
129	21	7107.	338.	429.	5695.	271.	330.	0.80139
131	10	4162.	416.	684.	3219.	322.	431.	0.77329
133	2	2349.	1175.	545.	1866.	933.	453.	0.79415
135	1	148.	148.	0.	148.	148.	0.	1.00000
141	17	5632.	331.	446.	5183.	305.	421.	0.92029
143	9	3008.	334.	356.	2997.	333.	353.	0.99634
145	7	8125.	1161.	1674.	5643.	806.	1082.	0.69455
147	4	511.	128.	42.	511.	128.	42.	1.00000
153	4	3688.	922.	1089.	2291.	573.	516.	0.62115
163	7	18794.	2685.	3111.	12985.	1855.	2272.	0.69092
172	4	880.	220.	82.	730.	183.	70.	0.82955
175	2	165.	82.	3.	138.	69.	16.	0.83838
193	18	6110.	339.	204.	4985.	277.	207.	0.81585
212	5	1050.	210.	153.	892.	178.	128.	0.84894
213	3	420.	140.	120.	394.	131.	126.	0.93878
214	6	1381.	230.	166.	1049.	175.	115.	0.75984
215	2	472.	236.	186.	448.	224.	191.	0.94986
216	11	5259.	478.	385.	3390.	308.	189.	0.64453
218	1	180.	180.	0.	180.	180.	0.	1.00000
221	4	445.	111.	30.	312.	78.	27.	0.70246
231	9	1910.	212.	112.	1809.	201.	98.	0.94691
251	83	26955.	325.	638.	21043.	254.	413.	0.78068
252	8	3304.	413.	356.	2013.	252.	170.	0.60927
258	3	283.	94.	46.	198.	66.	28.	0.70032
264	11	2285.	208.	143.	1853.	168.	114.	0.81098
271	41	105633.	2576.	3410.	66852.	1631.	1922.	0.63287
288	44	16131.	367.	684.	14952.	340.	608.	0.92690
291	25	59836.	2393.	4169.	44458.	1778.	3359.	0.74301
292	2	633.	316.	204.	330.	165.	52.	0.52080
294	17	6087.	358.	456.	3671.	216.	192.	0.60316
295	6	22713.	3786.	5622.	16193.	2699.	3879.	0.71295
296	10	3948.	395.	336.	2785.	278.	231.	0.70526
297	6	3332.	555.	412.	1960.	327.	266.	0.58833
301	11	1796.	163.	148.	1349.	123.	96.	0.75080
302	13	8608.	662.	1526.	5849.	450.	947.	0.67948
303	22	3282.	149.	142.	2464.	112.	63.	0.75095
305	20	4916.	246.	298.	3817.	191.	221.	0.77645
306	23	7973.	347.	331.	5727.	249.	185.	0.71829
311	14	7510.	536.	942.	6619.	473.	803.	0.88135
318	15	6850.	457.	631.	5868.	391.	584.	0.85674
323	49	73962.	1509.	4380.	58147.	1187.	3612.	0.78618
324	34	8101.	238.	267.	7513.	221.	254.	0.92744
326	4	1930.	482.	460.	1265.	316.	214.	0.65563
327	7	4931.	704.	945.	4030.	576.	720.	0.81727
328	3	427.	142.	45.	372.	124.	33.	0.87152
331	9	3124.	347.	380.	2741.	305.	346.	0.87745
332	13	12710.	978.	870.	7927.	610.	544.	0.62368
334	8	4535.	567.	1090.	2585.	323.	492.	0.57008
336	39	30606.	785.	2310.	21334.	547.	1329.	0.69707
337	7	1611.	230.	241.	1357.	194.	197.	0.84249
338	4	3002.	751.	1039.	1660.	415.	524.	0.55296
341	6	5233.	872.	688.	3901.	650.	580.	0.74543
345	2	2013.	1006.	412.	1130.	565.	184.	0.56144
347	18	6010.	334.	618.	3348.	186.	194.	0.55715
348	9	788.	98.	45.	[illegible]	71.	32.	0.91012
352	6	1674.	279.	456.	1125.	188.	253.	0.67234
353	1	118.	118.	0.	118.	118.	0.	1.00000
357	6	2520.	420.	343.	1844.	307.	195.	0.73158
365	14	13170.	941.	1300.	9979.	713.	[illegible]	0.75772
373	9	1399.	155.	146.	1074.	119.	97.	0.76770
374	37	11016.	298.	363.	8525.	230.	201.	0.77388
375	16	2796.	175.	238.	2287.	143.	188.	0.81786
377	22	3983.	181.	251.	3202.	146.	172.	0.80380
382	10	965.	97.	48.	952.	95.	49.	0.98653
383	2	565.	282.	68.	448.	224.	9.	0.79351
393	19	6518.	343.	249.	4810.	253.	208.	0.73792
397	9	2320.	258.	353.	1915.	213.	251.	0.82532
999	1191	411564.	346.	707.	354590.	298.	559.	0.86157

Notes: 1) SIC 105 stands for an aggregate of 105 and 107;
SIC 193 stands for an aggregate of 193 and 197;
SIC 288 stands for an aggregate of 288 and 289;
SIC 323 stands for an aggregate of 323 and 325.

2) There are no ultimates with primary activity in SIC's 151, 223, or 343: the corresponding lines have been deleted from Table 6.1.

Table 6.2 Mean and standard deviation of firms' employment in each industry, as constructed from D&B data on diversity.

SIC (1)	NCOL (10)	COLEMP (11)	COLAVG (12)	COLSTD (13)	OWNCOL (14)
103	35	4556.	130.	301.	0.45634
105	201	14330.	71.	259.	0.85634
111	65	12205.	188.	477.	0.74724
123	33	2260.	68.	97.	0.23812
128	24	6023.	251.	581.	0.62651
129	67	8381.	125.	325.	0.67953
131	34	5133.	151.	287.	0.62704
133	11	2270.	206.	410.	0.82207
135	4	295.	74.	62.	0.50243
141	51	5985.	117.	285.	0.86600
143	23	3000.	130.	274.	0.98892
145	30	5652.	188.	624.	0.99857
147	9	585.	65.	66.	0.87264
151	2	122.	61.	61.	0.0
153	18	3111.	173.	373.	0.73639
163	22	15551.	707.	1565.	0.83502
172	9	1405.	156.	208.	0.51957
175	4	275.	69.	25.	0.50303
193	47	6316.	134.	181.	0.78929
212	12	1828.	152.	227.	0.48776
213	8	597.	75.	94.	0.66099
214	16	1694.	106.	116.	0.61949
215	6	605.	101.	148.	0.74085
216	27	5122.	190.	225.	0.66175
218	8	526.	66.	56.	0.34231
221	11	627.	57.	85.	0.49873
223	2	141.	71.	29.	0.0
231	26	3194.	123.	126.	0.56633
251	247	29617.	120.	295.	0.71053
252	43	4634.	108.	221.	0.43439
258	4	198.	50.	37.	1.00000
264	31	2989.	96.	126.	0.62016
271	225	71753.	319.	1034.	0.93170
288	91	15993.	176.	454.	0.93493
291	72	46380.	644.	2147.	0.95857
292	11	3825.	348.	734.	0.08613
294	52	6275.	121.	171.	0.58512
295	19	16361.	861.	2512.	0.98973
296	34	6692.	197.	539.	0.41608
297	27	3231.	120.	183.	0.60675
301	51	4852.	95.	121.	0.27794
302	58	7871.	136.	487.	0.74309
303	77	5332.	69.	91.	0.46217
305	71	8074.	114.	242.	0.47273
306	62	7669.	124.	162.	0.74673
311	36	8582.	238.	553.	0.77123
318	42	6876.	164.	391.	0.85348
323	120	64556.	538.	2383.	0.90073
324	100	12712.	127.	361.	0.59103
326	14	4945.	353.	478.	0.25584
327	22	7102.	323.	613.	0.56752
329	11	698.	63.	53.	0.53257
331	45	5606.	125.	228.	0.48897
332	54	9908.	183.	414.	0.80001
334	25	7220.	289.	446.	0.35810
336	125	24472.	196.	782.	0.87190
337	26	2530.	97.	163.	0.53656
338	14	2384.	170.	328.	0.69635
341	31	4802.	155.	370.	0.91236
343	5	1521.	304.	508.	0.0
345	17	1526.	90.	197.	0.74064
347	63	5402.	86.	155.	0.61991
348	35	2198.	63.	115.	0.29037
352	15	1786.	119.	186.	0.63017
353	4	239.	60.	40.	0.49412
357	13	1956.	150.	197.	0.94239
365	51	10072.	197.	568.	0.99574
373	54	5965.	110.	197.	0.18011
374	80	9903.	124.	176.	0.86082
375	46	4251.	92.	176.	0.53797
377	37	4531.	122.	152.	0.70658
382	21	1116.	53.	57.	0.85372
383	5	714.	143.	79.	0.62789
393	56	6031.	108.	166.	0.79747
397	24	2066.	86.	183.	0.92686
999	3765	439220.	117.	393.	0.80732

Note: SIC 105 stands for an aggregate of 105 and 107;
SIC 193 stands for an aggregate of 193 and 197;
SIC 288 stands for an aggregate of 288 and 289;
SIC 323 stands for an aggregate of 323 and 325.

METHODOLOGICAL CONSIDERATIONS

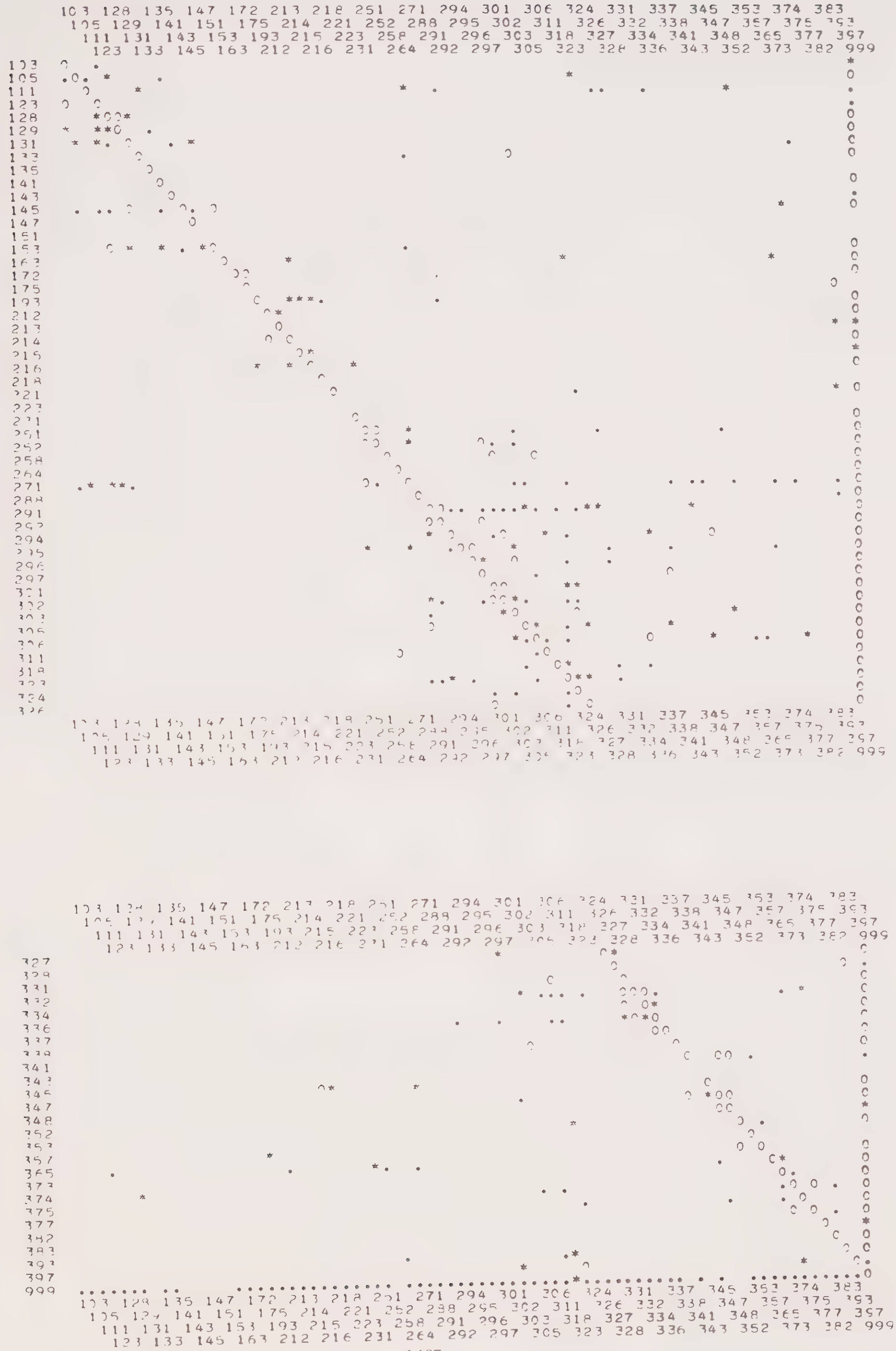
As a first step in trying to find some regularity in the interindustry diversification patterns, a descriptive approach was taken. The COP's of firms having the same primary activity were aggregated--by simple summation of the corresponding elements of the COP's--and the resulting industry output profile was scaled--divided by the sum of its elements--so as to yield a percentage breakdown across activities of employment in firms classified to that industry. The end product was a 76x76 array of numbers, the rows of which add up to one.

Though it was less awkward to manipulate than the original 451x451 array (before aggregation), this large diversification matrix did not prove to be greatly inspiring. In an attempt to highlight patterns, a "map" of the matrix was drawn in the following way. Each number in the matrix was replaced by a single print character: a blank ( ) if the corresponding element was zero; a point (.) if it was greater than zero, but smaller than 0.01; an asterisk (*) if it was greater than 0.01, but smaller than 0.05; a zero (0) if it was greater than 0.05. Table 6.3 reproduces the map.

There are two striking features to this map. The first is that it is mostly empty. This could be a clue that firms diversify only in certain directions, others being ruled out for economic reasons. But, recalling Chapter 4's discussion of patterns of diversification in Canadian companies (pp.102 ff.), it is likely that some of the blanks in the map represent opportunities that no Canadian firm was able to take advantage of, because of the low number of firms and of their relatively small size. A comparison with the U.S. analog of this map could be illuminating in this respect. The second feature of the map is its diagonality: a lot of diversification seems to take the form of a broadening of the product line, within the same two- or even three-digit industry. This aspect of diversification had already been noticed by Caves (1975), and it is taken into account by the weighted index of diversification. Its explanation is to be found in the principles underlying the design of standard industrial classifications; those are briefly discussed in Chapter 4, and some of the hypotheses they suggest about patterns of diversity are set out in the next part of this chapter. Finally, despite the impression given by the heavy diagonal band, the matrix does not seem to be remarkably symmetric, although there exists no standard measure of symmetry that could be referred to.

In any case, it is obvious that most hypotheses suggested by economic theory, along the lines of those of Chapter 4's conceptual framework (pp. 94ff.), are unlikely to show up as geometric patterns visible to the naked eye. The theoretical model would be similar to a dynamic portfolio

Table 6.3 ''Map'' of interindustry patterns of diversity.



Notes: 1) SIC 105 stands for an aggregate of 105 and 107;
SIC 193 stands for an aggregate of 193 and 197;
SIC 288 stands for an aggregate of 288 and 289;
SIC 323 stands for an aggregate of 323 and 325.

2) Rows 151, 223, and 343 are blank, because there are no ultimates with either of these SIC numbers as primary activity.

management optimization model, with productive and marketing capacities playing the part of assets. And, of course, this would be but a submodel of the grand model of the firm. But the portfolio approach is presently blocked by many forbidding obstacles. Apart from the intrinsic complexities of the portfolio problem, one encounters formidable measurement difficulties: what is a unit of productive capacity? of marketing capacity? what are their costs and yields? Moreover, at a down-to-earth level, the aggregation of several heterogeneous activities in a single residual category adds to the difficulties of testing the hypotheses.

Undoubtedly, a more modest approach must be taken here. This consists of testing hypotheses about expected associations between COP elements and other variables. The contrast between the latter and the former approach can be illustrated by the discrepancy often found between the theoretical model of consumer behavior and some empirical studies of demand functions.

The shortcomings of this methodology would tend to reinforce the statement in Chapter 4 that "one cannot expect to explain very much of the patterns of diversification we observe on the basis of general forces operating in the economy". Efforts to produce a model with any significant degree of predictive power are unlikely to be successful, and attention should be focused on testing hypotheses on the relevance of different factors in the analysis of diversity patterns.

Theoretical propositions underlying these hypotheses are statements about various influences concurring to shape diversification patterns, rather than statements about alternative and mutually exclusive "explanations". Linear regression analysis is used as a tool to implement this approach, but it must be kept in mind that it only provides a convenient format for a kind of covariance analysis, and that it does not in any way constitute a model of the phenomenon under study.

THE DELINEATION OF SAMPLES AND CONSTRUCTION OF A DEPENDENT VARIABLE

The first part of this chapter described the data on interindustry patterns of diversity: an array of numbers, each row of which is a COP. It is immediately obvious that it is useless to try and "explain"--in the regression analysis sense of the word--the numbers relating to residual industry #999. So the COP's of firms whose primary activity is industry #999 are dropped from the sample. Moreover, the last elements of the COP's, those corresponding to industry #999, although they are kept in the data array to preserve the accounting identity, are to be excluded from the samples for the purposes of regression analysis.

On the other hand, since it is clear from the discussion in the second part of this chapter that the "model" cannot be expected to be correctly specified, it is certainly commendable to partition the data into subsamples to which to fit different regression planes, in order to control for some of the "missing variables". Tests can then be run to decide whether subsamples can be pooled.

But how to delineate subsamples is far from obvious. So far, the data array has been seen as a stack of rows, i.e. of COP's. But it can also be read column by column, each column referring to an activity, i.e. to an output or market. The column point of view, of course, is that of inbound diversification. The degree of inbound diversification has been studied in Chapter 5. Here would be the place to study patterns of inbound diversification. Due to insufficient time and resources, it was impossible to deal immediately with patterns of both inbound and outbound diversification. A provisional choice had to be made between the two: the latter was chosen. Although this decision cannot be fully justified, two major reasons contributed to tip the scale. First, it appeared that most of the hypotheses that came to mind had to do with the firm's investment decisions, and were focused on the decision-maker, rather than on the market (although, in most cases, the hypotheses could have been tested either way). Second, as is pointed out in Chapter 4, "the census industry is typically a 'branch of trade', perhaps inappropriate for the economic definition of a market...". So the unit of observation is the firm, rather than the market.

Further, it is desired to pool data across companies with the same primary activity, since the focus is on industry characteristics. In principle, pooling tests could be performed. At this stage, however, the required volume of computation is prohibitive; so it was necessary to proceed with little theoretical justification. In addition, ignoring firm-specific variables can only cast further doubt on the appropriateness of pooling data across firms, for, surely, it would be expected that some company characteristics are also important.

One way to alleviate this weakness somewhat is to transform the dependent variable so as to reduce the importance of company-specific factors. To begin with, COP's are readily broken down into three components: a scale factor, the level of diversity, and the pattern of non-primary activities. The scale factor is company size or, more precisely, total manufacturing employment. Concerning the level of diversity, several measures of it have been discussed in Chapter 4. And, as evidenced by Table 4.1, all are fairly highly correlated. Here, of course, the useful one is the analog under the Canadian 1960 three-digit SIC of <u>DE4</u>: the percentage of the firm's total employment assigned to its primary industry. Division of each element of the COP by the scale factor, and again by one minus the level of diversification, yields diversification coefficients:

<u>PXCOP(I,J)</u>	Percentage of company I's non-primary employment assigned to industry J, for J $\neq$ <u>PC3(I)</u>, i.e. if industry J is not company I's primary activity.

As for <u>PXCOP(I,PC3(I))</u>, it contains no information whatsoever on the pattern of non-primary activities, but only on the level of diversification, so it is dropped from the sample for regression purposes.

Thus, if the three components of the COP (scale, level of diversity and pattern of non-primary activities) were independent, it could be said that PXCOP has been purged of the influence of those firm-specific factors that determine scale and the level of diversity. But Chapter 4 has shown a relationship between the level of output diversity and scale, and the general theoretical model would lead one to expect strong interdependences between all three components. Nonetheless, it is felt that, since company-specific factors are not taken into account, and it is still desired to pool data across firms classified to the same industry, then PXCOP constitutes a more appropriate form of the independent variable.

It should be noted that, due to the special significance assigned to the firm's primary activity, patterns of diversity represented by PXCOP are not, strictly speaking, comparable for companies with different primary activities. Moreover, it will be seen in the next section that the list of regressors does not include at present any base-industry variables (variables relating to the primary activity of the diversifying firm). These, of course, are superfluous in the absence of cross-industry pooling, since they are identical for all observations, and are subsumed under the intercept. But, with such specification, any test is undoubtably biased against the hypothesis that data can be pooled across industries. Nonetheless, regressions will be computed on the pooled sample, and pooling tests will be performed: should the tests fail to reject the hypothesis that the two samples can be pooled, the imperfect comparability would only serve to reinforce the presumption that, indeed, the two should be pooled.

Returning to the question of whether data can be pooled across firms classified to the same industry, it is clear that there are alternatives to pooling tests. There is analysis of variance, which is essentially the same thing, and requires an equally prohibitive volume of computations. Another quite tractable method that is rather fashionable nowadays is clustering analysis, which can be crudely characterized as an algorithm for designing a "good" aggregation of multivariate observations, using a Euclidian distance criterion. Finally, due to the time constraint, it was decided to use a rough-and-ready method.

Each firm's COP was divided by its scale (manufacturing employment) and the resulting 76-element vector was called PCOP. For each industry, a 76-element PIOP vector was computed as a weighted average of the PCOP's of firms belonging to it, with weights proportional to firm scale. Euclidian distances were then taken between each firms's PCOP and its industry's PIOP as well as between pairs of industries. A summary of the results is presented in Table 6.4:

(1) SIC — Canadian 1960 three-digit industry SIC code.

(2) AVDISW — Average distance within industry, between PIOP of industry referred to in (1) and PCOP's of firms classified to it.

(3) STDISW — Standard deviation of distance between PIOP of industry referred to in (1) and PCOP's of firms classified to it.

(4) AVDISA — Average distance across industries, between PIOP of industry referred to in (1) and PIOP's of the 74 other industries.

(5) STDISA — Standard deviation of distance between PIOP of industry referred to in (1) and PIOP's of the 74 other industries.

Just as one would hope, the average within-industry distances are much smaller than across-industry distance, with a relatively narrow dispersion in both cases. But then, much of that desirable result may be attributable to the simple fact that, within each industry, all firms have the same primary activity, by construction: the less diversified are companies, the greater the relative importance of their primary activities, and the smaller the within-industry distances; likewise, the more specialized are PIOP's, the greater the across-industry distances.

But we are more interested in the patterns of secondary activities than in the degree of diversification so, to provide a counterweight to the above bias, the same distances were computed between each firm's PXCOP and its industry's PXIOP (a weighted average of PXCOP's). A summary of the results is presented in Table 6.5.

(1) SIC — Canadian 1960 three-digit SIC codes.

(6) XAVDSW — Average distance within industry, between PXIOP of industry referred to in (1) and PXCOP's of firms classified to it.

(7) XSTDSW — Standard deviation of distance between PXIOP of industry referred to in (1) and PXCOP's of firms classified to it.

(8) XAVDSA — Average distance across industries, between PXIOP of industry referred to in (1) and PXIOP's of the 74 other industries.[3]

(9) XSTDSA — Standard deviation of distance between PXIOP of industry referred to in (1) and PXIOP's of the 74 other industries.

As expected, results display within-industry distances that are much closer to across-industry distances (often within one standard deviation). It should be noted that distances between PXIOP's may exaggerate differences across industries in patterns of activity, when one industry's primary activity is another's most important secondary activity; this type of distortion, however, appears to be negligible here.

From all this, it is cautiously concluded that it is valid to pool data across firms classified to the same industry. But the heterogeneity of diversity patterns within industries is certainly an indication of the importance of firm-specific factors. Firm-specific factors could be impounded in firm dummies added to the list of independent variables, if the firm-specific factors did not interact with industry characteristics. And even if they do, it seems sensible to use the dummy variable technique to allow for different

Table 6.4 Distance within industries between **PCOP**'s and across industries between **PIOP**'s.

SIC (1)	AVDISW (2)	STDISW (3)	AVDISA (4)	STDISA (5)
103	0.034	0.873	122.138	9.144
105	17.575	8.896	114.012	9.960
111	15.257	9.792	117.188	9.754
123	19.575	2.250	116.589	9.622
128	24.303	8.444	107.267	11.026
129	21.878	5.261	111.097	10.404
131	23.819	4.191	109.141	10.536
133	6.201	2.879	110.917	10.339
135	0.0	0.0	126.257	8.793
141	10.318	6.435	120.041	9.422
143	0.383	0.048	125.973	8.819
145	27.889	7.890	104.330	11.147
147	0.000	0.000	126.243	8.796
151	0.0	0.0	76.542	17.192
153	33.476	12.024	100.454	11.681
163	20.259	10.368	103.629	11.142
172	25.266	8.279	113.773	9.999
175	23.570	0.714	114.808	9.985
193	19.370	10.077	112.235	10.233
212	18.303	9.107	114.666	9.923
213	17.210	15.211	121.447	9.238
214	19.770	9.129	108.603	10.595
215	15.859	12.499	122.327	9.178
216	28.911	10.900	100.628	11.599
218	0.0	0.0	126.204	8.878
221	16.592	8.848	104.390	11.051
223	0.0	0.0	76.542	17.192
231	6.094	1.598	122.071	9.249
251	21.637	6.149	109.708	10.872
252	30.392	10.827	99.320	11.956
258	24.178	8.704	104.939	11.089
264	17.964	5.547	111.918	10.188
271	24.024	11.898	99.700	11.685
288	9.619	7.410	120.590	9.343
291	25.676	10.564	107.027	11.135
292	32.256	20.740	95.405	12.639
294	31.017	11.382	98.396	11.914
295	29.490	10.501	105.856	11.028
296	22.767	9.946	104.909	11.179
297	26.416	10.650	97.414	12.541
301	26.176	4.919	107.828	11.049
302	26.430	8.479	102.865	11.464
303	25.593	8.350	107.529	10.757
305	24.049	6.960	109.390	10.985
306	26.304	7.939	105.356	11.076
311	15.258	6.304	117.119	9.692
318	18.261	12.065	115.297	9.881
323	20.097	5.428	110.024	10.421
324	12.542	12.339	120.283	9.389
326	29.143	9.563	102.437	11.396
327	21.931	8.357	112.395	10.174
328	19.641	2.454	116.911	9.747
331	16.722	5.222	116.683	10.029
332	25.898	10.805	99.882	11.639
334	28.124	15.957	96.223	12.123
336	23.609	10.133	103.936	11.249
337	18.667	7.274	114.372	10.006
338	32.340	18.091	96.180	12.347
341	26.353	8.711	108.230	11.237
343	0.0	0.0	76.542	17.192
345	10.634	4.350	96.078	12.179
347	37.058	11.479	96.714	12.489
348	26.831	4.139	112.617	10.866
352	29.031	8.685	102.317	11.311
353	0.0	0.0	126.255	8.796
357	24.585	4.443	106.471	10.860
365	20.044	10.155	108.172	10.623
373	17.396	8.613	108.834	10.566
374	22.741	5.392	109.245	10.558
375	18.609	8.203	112.428	10.170
377	23.664	2.674	111.979	10.320
382	3.077	5.192	125.204	8.894
383	16.667	3.982	110.706	10.352
393	23.268	8.767	106.505	10.710
397	21.520	0.465	113.544	9.952
	19.195	7.279	108.949	10.813

Note: SIC 105 stands for an aggregate of 105 and 107;
SIC 193 stands for an aggregate of 193 and 197;
SIC 288 stands for an aggregate of 288 and 289;
SIC 323 stands for an aggregate of 323 and 325.

Table 6.5 Distance within industries between **PXCOP**'s and across industries between **PXIOP**'s.

SIC (1)	XAVDSW (6)	XSTDSW (7)	XAVDSA (8)	XSTDSA (9)
103	0.015	0.286	31.770	23.544
105	23.222	13.025	38.024	19.848
111	54.908	15.199	65.026	13.896
123	79.175	38.900	104.964	8.853
128	59.661	22.483	68.450	13.369
129	26.611	19.355	38.744	19.639
131	30.006	24.278	41.800	19.175
133	29.510	11.286	52.129	16.709
135	0.0	0.0	30.382	24.790
141	0.0	0.0	30.382	24.790
143	0.0	0.0	30.382	24.790
145	41.683	9.370	51.984	16.261
147	0.0	0.0	30.382	24.790
151	0.0	0.0	30.382	24.790
153	68.008	45.756	60.312	14.939
163	17.521	13.154	33.818	22.499
172	50.000	28.867	75.980	12.205
175	50.000	50.000	103.944	14.838
193	27.611	24.291	36.632	21.026
212	31.284	10.047	43.187	18.732
213	22.222	15.713	47.129	15.052
214	38.247	15.387	54.008	15.974
215	50.000	20.423	45.052	18.517
216	23.716	1.972	40.989	19.455
218	0.0	0.0	30.382	24.790
221	12.117	8.046	32.133	22.538
223	0.0	0.0	30.382	24.790
231	0.0	0.0	30.382	24.790
251	38.309	12.891	48.615	17.020
252	44.179	10.831	54.117	15.953
258	45.708	9.000	57.483	15.405
264	0.0	0.0	30.382	24.790
271	26.649	19.954	37.044	20.050
288	2.492	4.426	30.636	24.302
291	45.790	21.347	46.298	17.583
292	23.615	23.615	58.030	15.099
294	39.363	21.813	44.895	17.043
295	48.129	13.198	61.332	14.414
296	47.873	16.704	52.123	16.073
297	35.054	31.866	45.789	17.923
301	59.344	17.773	60.468	14.838
302	52.638	29.676	43.840	18.259
303	39.008	20.684	45.438	17.774
305	42.905	16.526	50.222	16.748
306	33.922	20.337	40.881	18.740
311	46.731	6.210	59.547	14.859
318	31.549	19.295	41.590	19.539
323	29.771	16.177	40.358	19.205
324	15.491	17.237	33.054	22.778
326	40.415	20.911	60.066	15.384
327	37.820	36.369	36.726	20.741
328	64.720	45.764	101.216	14.683
331	44.271	12.687	50.421	14.727
332	43.563	12.643	49.983	17.084
334	19.539	7.035	39.916	19.771
336	22.586	13.253	38.977	20.081
337	42.703	7.150	52.777	16.519
338	36.088	19.833	52.104	16.462
341	31.500	19.582	75.905	11.802
343	0.0	0.0	30.382	24.790
345	19.066	9.850	44.452	18.557
347	54.587	21.126	58.472	14.746
348	61.918	34.952	93.025	10.655
352	7.955	3.557	32.839	23.008
353	0.0	0.0	30.382	24.790
357	28.607	10.844	41.340	19.214
365	20.145	15.532	35.148	21.599
373	8.016	10.839	31.324	23.789
374	29.430	8.823	44.164	18.310
375	11.177	22.524	31.253	23.883
377	58.461	15.674	74.746	12.421
382	0.0	0.0	30.382	24.790
383	0.0	0.0	30.382	24.790
393	15.520	15.034	33.192	22.803
397	66.431	22.360	31.347	12.716
	29.981	14.983	47.771	18.342

Note: SIC 105 stands for an aggregate of 105 and 107;
SIC 193 stands for an aggregate of 193 and 197;
SIC 288 stands for an aggregate of 288 and 289;
SIC 323 stands for an aggregate of 323 and 325.

values of the intercept for different firms, thus capturing at least part of the firm-specific factors.

By the same token, results in Tables 6.4 and 6.5 confirm that the COP's of firms with the same primary activity are different enough to be considered as genuinely different observations, and not as repeated drawings of the same observation, as would be the case if patterns of diversity were entirely determined by a firm's primary industry: if the latter were true, taking firm data as dependent variables would artificially inflate the number of degrees of freedom. The question arises, when no firm-specific variables appear as regressors, from the fact that corresponding diversification coefficients of different firms of the same industry are associated with identical values of the independent variables.

HYPOTHESES AND REGRESSORS

As was mentioned earlier, the goal pursued here is not to test two or more mutually exclusive theories against each other. Rather, it is to test the relevance of various factors that are hypothesized to contribute to the determination of patterns of diversity.

The hypotheses presented here by no means exhaust the potential of a fertile imagination (and of economic theory). They are only those that are ready to be tested. There is very little in the literature specifically concerning interindustry patterns of diversity. An exception is Gilbert (1971). Using data as the two-digit level of the U.S. SIC, Gilbert formulated and tested a few hypotheses: his work has provided a useful starting point.

The first hypothesis considered is one with which Gilbert was quite successful: the opportunity for vertical integration, as represented by coefficients of the input-output system:

DBIO(J,K) — Share of industry K's intermediate purchases that are supplied by industry J.[4]

DBIO(J,PC3(I)) is expected to be positively related to PXCOP(I,J): the more important industry J as a supplier of firm I, the stronger the incentive for firm I to integrate vertically backward into industry J. Conversely, DBIO(PC3(I),J) is also expected to be positively related to PXCOP(I,J): the more important industry J as a customer of firm I's primary product, the stronger the incentive for forward vertical integration. But it seems that the importance of industry J as a buyer of firm I's principal output would be better measured by:

CSALTO(K,J) — Share of industry K's total sales that go to industry J.

And CSALTO(PC3(I),J) is expected to be positively related to PXCOP(I,J). So is, of course, CSALTO(J,PC3(I)).

The two variables DBIO(J,PC3(I)) and CSALTO(PC3(I),J) are thus the preferred formulation of the vertical integration hypothesis. It is believed that this might improve somewhat on Gilbert's original formulation, which uses equivalents of DBIO(PC3(I),J) and DBIO(J,PC3(I); this, of course, will be tested.

The second hypothesis considered is that it is more likely that firms will be simultaneously active in two industries that require a common raw material or, more generally, a common input. Gilbert saw this, together with the use of a common distribution channel as the major missing variables in his model. Four variables have been constructed as proxies for the existence of a common raw material. All four are expected to be positively related to PXCOP(I,J), for K = PC3(I), but it is not known how well they will perform. All are based on the idea that the scalar product of two vectors is higher when large elements in one correspond to large elements in the other. Being scalar products, of course, the following variables are symmetric:

CCOM1(K,J) Inner product of input coefficient vectors of industries K and J.[5]

CCOM2(K,J) Inner product of the input purchase vectors of industries K and J.

It has been pointed out to us[6] that the deviations of coefficients from cross-industry averages are probably more accurate measures of their importance. Hence:

CCOM3(K,J) Inner product of vectors of deviations of input coefficients of industries K and J from cross-industry average.

CCOM4(K,J) Inner product of vectors of deviations of input purchases of industries K and J from cross-industry average.

The third hypothesis is an extension of the second. Not only the use of a common raw material, but, more generally, technological similarity is expected to be associated with higher diversification coefficients. Two major problems arise here: how to characterize technologies, and how to measure their similarity. Industry input structures are plausible candidates for the representation of technologies. Variables proposed to measure their similarity are:

CINEU1(K,J) Euclidian distance between the input structures of industries K and J.

CINEU2(K,J) Squared Euclidian distance between the input structures of industries K and J.

CINCOS(K,J) Cosine of angle between input structure vectors of industries K and J.

It must be kept in mind that the above variables are related to CCOM1 and CCOM3 by definitional identities, so that multicollinearity problems can arise from including variables from both groups in the same regression.

Of course, input structures are at best an incomplete characterization of technology. Attempts have been made to find data on the manpower occupational structures and on the capital input structures of industries. Such data could not be found for Canada, and, even if they could be secured for the United States,[7] the format in which they were available did not make them readily usable.

The fourth hypothesis concerns the joint marketing of products and the use of common distribution channels. Ideally, one would wish to obtain for each industry a breakdown of shipments by type of outlet. This kind of data is

available for the United States (U.S. Dept. of Commerce, 1967), but was not readily usable for our purposes. However, use can be made of the distinction between producer and consumer goods and, among the latter, between convenience and non-convenience goods. These distinctions are discussed in Chapter 3. Here, three dummy variables are used to try and capture those effects:

CONV(K,J) =1, if both goods are consumer convenience goods;
=0, otherwise.

NONC(K,J) =1, if both goods are consumer non-convenience goods;
=0, otherwise.

PRGD(K,J) =1, if both goods are producer goods;
=0, otherwise.

Additional variables have been constructed to test the same hypothesis, jointly with these dummies. Again, use is made of the structural parameters of the input-output system. A high cross-industry correlation between a pair of input coefficients, or between intermediate purchases of a pair of goods, can be taken to mean that the same industries that buy one product also buy the other. Hence, the opportunity for economies of joint marketing would lead one to expect such correlation to be positively related to diversification coefficients.

CINCO1(K,J)	Cross-industry correlation of input coefficients of products of industries K and J.
CINCO2(K,J)	Cross-industry correlation of input purchases of products of industries K and J.

Two more variables, derived from the above, take account of the possibility that their influence might be insignificant if the two goods involved are not producer goods:

CINCO3(K,J) = CINCO1(K,J) if both goods are producer goods;
= 0 otherwise.

CINCO4(K,J) = CINCO2(K,J) if both goods are producer goods;
= 0 otherwise.

All the above variables, and the hypotheses they represent, pertain to pairs of industries, and all of them, except those concerning vertical integration, are symmetric in that they bear no indication of the direction of diversification. Drawing upon the evidence of Chapter 5 on the determinants of inbound diversification, it is easy to complete the list of regressors with variables that indicate the attractiveness of industries as diversification targets. On the other hand, no attempt is being made at the present stage to assess the influence of determinants of the diversifying firm's strength, or of its base industry's outbound thrust, on the patterns of diversity.

Three hypotheses are made about industries' attractiveness for diversification. The first concerns seller concentration. The potential for supernormal profits--and, hence, the attractiveness of an industry--tends to increase with concentration: it is expected that diversification coefficients PXCOP(I,J) will increase with C468(J). On the other hand, however, very high concentration would generally indicate blockaded entry, so a negative coefficient would be expected on the dummy variable HIC4(J). Finally, it may be possible to capture the strength of the diversifying firm relative to both the attractiveness and difficulty of entry into the target industry with:

DC4(K,J) = C468(K) - C468(J).

Its coefficient is expected to be positive.

The second hypothesis concerns growth. Two variables are available in the general data base as indicators of growth: GSI and SMCI, and they are expected to be positively correlated to diversity coefficients. Here again, one can think of interaction variables:

DGSI(K,J) = GSI(K) - GSI(J)

RGSI(K,J) = GSI(K) / GSI(J)

DSMCI(K,J) = SMCI(K) - SMCI(J)

RSMCI(K,J) = SMCI(K) / SMCI(J)

They all should be negatively related to diversity coefficients.

The last hypothesis concerns profitability: the relevant variable here is ROI. Interaction variables, constructed as differences or ratios of ROI's are not recommended here: given the ROI in the target industry, its attractiveness is not greater if the base industry ROI is small; on the contrary, the smaller the ROI in the base industry, the less resources the firm has for diversification.

Finally, following the discussion at the end of the preceding section, it is thought that results will be improved by adding company dummies. This does not present any particular difficulty if data are not pooled across primary activities: as there are generally few ultimate companies in each industry, adding the dummies still leaves enough degrees of freedom. With the grand pooled sample, however, even if there are enough degrees of freedom, the computer simply cannot handle thousands of regressors. Perhaps this can be circumvented. In any case, as a second best, it is possible to have 74 primary activity dummies.[8]

PRELIMINARY SPECIFICATION AND FIRST RESULTS

The hypotheses to be tested have been put forth in the preceding section and, in most cases, several formulations have been suggested. It is clear that, even under the most favorable conditions, it is hardly practicable to try out all the rational possibilities for the specification of the list of regressors. There are nearly two thousand possibilities, and each one would have to be run 75 times (once for each industry, and once for the pooled sample), for a grand total of close to 150,000 regressions to be computed and analyzed. Clearly, a search strategy is needed.

But such a strategy can only be designed step by step, as the results unravel. So at this point, only the first step can be described in any detail.

Table 6.6 presents two alternative specifications of the list of regressors, with the expected sign of the coefficients. With each specification, regressions are to be run for each industry and for the pooled sample. The first specification is the "preferred" one, the one that is expected to yield best results. In the second specification, each hypothesis is represented by what is thought to be its second best formulation.

These regressions are only one part of the first step. The other consists of computing simple and partial correlations for different subsets of variables as ground work for improving on the initial specifications. Correlations analysis is to be performed with the pooled sample only, for the time being.

Table 6.6

Alternative specifications of regressors and expected signs of coefficients

Hypothesis	Variable	Specification I	Specification II
Vertical integration	DBIO(PC3(I),J)		+
	DBIO(J,PC3(I))	+	+
	CSALTO(PC3(I),J)	+	
Common input	CCOM3(PC3(I),J)	+	
	CCOM4(PC3(I),J)		+
Technological similarity	CINEU2(PC3(I),J)	+	+
Joint marketing	CINCO2(PC3(I),J)		+
	CINCO4(PC3(I),J)	+	
	CONV(PC3(I),J)	+	+
	NONC(PC3(I),J)	+	+
	PRGD(PC3(I),J)	+	+
Concentration	C468(J)		+
	HIC4(J)	–	–
	DC4(J)	+	
Growth	SMCI(J)	+	+
Profitability	ROI(J)	+	+
Company dummies		?	?

At this early stage, no effort need be made to achieve any degree of econometric sophistication, and ordinary least squares are used freely for exploratory purposes. Clearly, however, there are at least two problems that must be dealt with.

First, the use of PXCOP as a dependent variable is questionable, because of the constraint that the PXCOP values of each firm must add up to 1.0. This would cause no major problem if a separate regression were run for each firm, or for each target industry: it is a well known property of ordinary least squares that, under such conditions, adding-up constraints would be satisfied automatically over the sample space. But pooling the data introduces the problem of constraints on subsets of the observations of the dependent variable. One way to circumvent the difficulty would be to replace the dependent variable PXCOP with:

SOAP(I,J)	Employment of company I in industry J, as a percentage of company I's primary employment (in industry PC3(I)).

However, preliminary work with this alternative dependent variable seems to indicate inferior performance.

A second econometric problem arises from the PXCOP values' being contained in the bounded (0,1) interval. In response to this, experimentation has begun with two-limit probit analysis.[9] This statistical model is based on a specification that looks promising. The dependent variable (say, Y) is assumed to be related to an underlying unobservable variable (say, Z in the following way:

$$Y = \begin{cases} 0 \text{ , if } Z < 0 \\ Z \text{ , if } 0 \leq Z \leq 1.0 \\ 1.0 \text{ if } Z > 1.0. \end{cases}$$

The unobservable Z is then assumed to depend on the various regressors:

$$Z - a_o + a_1 X + a_2 X_2 + \ldots$$

Here, it is natural to interpret Z as an index of attractiveness of diversification opportunities. Coefficients are estimated by maximum likelihood.

The procedure also allows one to estimate the coefficients even when Y itself is imperfectly observable: all that needs be known of each observation is whether it is equal to a limit value and, if so, which one. This feature is eminently attractive, given the procedure used to construct COP's.

There is no doubt that the ordinary-least-squares method of estimation is not theoretically justifiable in the present context, while two-limit probit is. But it is still unknown whether switching methods will alter results substantially.

Due to the massive data handling requirements of this chapter, few results could have been available, other than the descriptive data presented in Tables 6.1 through 6.5. Moreover, the data base specific to this chapter is undergoing major repairs for recently discovered errors that falsify whatever analytical results had been obtained previously.

Examination of the revised data suggests the following comments:

1. Looking at the simple correlations between the proposed regressors and PXCOP(I,J), they generally have the expected sign, but many are very small. Over the full sample of 62173 observations (most of which are zero), the variables that have the highest correlations are[10]: CINCO3(PC3(I),J), DBIO(PC3(I),J), CCOM3(PC3(I),J), DBIO(J,PC3(I)), PRGD(PC3(I),J), CINEUI(PC3(I),J). Magnitudes of the correlation coefficients are not impressive: they range from 0.110 for CINCO3, to 0.022 for CINEU1. Moreover, multicollinearity is rampant; for instance, simple correlation between CINCO and CCOM is 0.177, stronger than the association of either with the dependent variable.

2. Turning to the subsample of 337 non zero observations, the picture is pretty much the same[10]: CINCO3(PC3(I),J), CCOM (PC3(I),J), CINCOS(PC3(I),J), PRGD(PC3(I),J), DBIO(PC3(I),J), DBIO(J,PC3(I)) have the highest correlations with PXCOP(I,J), ranging from 0.239 to 0.041.

3. In statistical terminology, it appears that the non zero PXCOP coefficients do not belong to the same population as the zero coefficients. With the subsample of 337 non zero coefficients, we obtained multiple correlation coefficients (R^2) of the order of 15%, compared to about 2% for the full sample. This would reinforce our suspicion that some of the blanks in the map represent opportunities that no Canadian firm was able to take advantage of, because of the low number of firms and of their small size.

NOTES TO CHAPTER 6

1. The D&B SIC is basically the U.S. 1972 four-digit SIC, but contains some 1967 codes.

2. Or, in a few cases, groups of two Canadian 1960 SIC codes.

3. Vectors of PXCOP's, as we have seen, are not strictly comparable between industries. The same applies to PXIOP's.

4. In the notation used by Statistics Canada, this is an element of the product matrix DB. The reader who is unfamiliar with the Canadian input-output system is referred to Statistics Canada (1976). Thanks are due to Statistics Canada for special collaboration.

5. In Statistics Canada's notation, the input vector is a column of the matrix B. See Statistics Canada (1976).

6. Thanks are due to Professor Anne P. Carter, of Brandeis University.

7. For the manpower matrix, see U.S. Bureau of Labor Statistics (1972). A magnetic tape containing U.S. capital coefficients has been graciously made available by Professor Anne P. Carter of Brandeis University.

8. Industry SIC#328 had to be dumped into residual category 999, because input-output data aggregated SIC#328 with SIC#329. This leaves 74 industries, not counting residual category #999.

9. See Tobin (1958) and Rosett-Nelson (1975).

10. Results are not available for CSALTO. The list skips the three variants of CINCO and of CCOM other than the leading one.

REFERENCES - CHAPTER 6

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PART THREE

CONCENTRATION AND ITS SOURCES

Chapter 7

DETERMINANTS OF SELLER CONCENTRATION:

LEVELS AND CHANGES

R. E. Caves

This part of our study is concerned with concentration in the Canadian economy. Concentration is under review here in both of its senses: the concentration of activity within an industry's leading firms, and the concentration of activity in the economy's largest companies. A company can be big because it operates in big markets, because it operates in many markets, and/or because it accounts for large shares of activity in these markets. The concentration of sellers' shares in an industry is itself a datum largely determined by more fundamental structural forces in the industry and the economy. Therefore, in order to explain the role of large companies in the Canadian economy, we proceed first to explain concentration in Canadian manufacturing industries (the present chapter), and then link the activity of large manufacturing companies to concentration in the industries where they operate (Chapter 8).

CONCENTRATION: COMPONENTS AND DETERMINANTS

In research on industrial organization, concentration is often treated as one (*primus inter pares*) of a set of independent elements of market structure. This practice flies in the face of considerable evidence that the concentration of an industry's sellers is not determined by purely exogenous technical factors. Rather, it depends on other elements of the structure of markets (such as economies of scale and product differentiation) and on the past conduct of the companies operating in the market. Numerous studies have shown that one can explain a large proportion of the differences among industries' concentration levels on the basis of these structural and behavioral forces. The presence of systematic forces determining concentration is also attested to by the high correlations of concentration patterns among countries. Pryor[1] found that concentration in industry *x* in the United States is quite a good predictor of concentration in industry *x* in another industrial country. Rosenbluth reported a correlation of 0.71 between concentration levels in Canada and the United States, although he was inclined to emphasize the looseness rather than the tightness of the relation.[2]

Analyzing the determinants of concentration is a somewhat delicate task because concentration is itself a summary statistic taken from various primary dimensions of the number and size distribution of companies in a market. That is, concentration can be high because companies in a market are few in number, because the largest sellers' shares greatly exceed small sellers' shares, because the large sellers' plants have much greater outputs than the small sellers' plants, and/or because the large sellers each operate many more plants than the small sellers. Yet these conditions do not *cause* concentration; they are the primary traits of the number and size distribution of an industry's plants and companies that are *summarized* by our standard indexes of concentration.

Indeed, it is easy and sometimes fruitful to write out expressions that relate simple measures of concentration (say, the share of shipments controlled by the largest four sellers) to a set of terms such as those listed above in the form of a closed identity. We cannot infer causation from an identity. Statistically, we can "explain" any one component of an identity completely on the basis of its components. Statistical evidence can indicate only how closely the empirical variation of any one identity component is associated with subsets of the others.

An error committed by many analyses of the determinants of concentration (Rosenbluth's study of concentration[3] in Canada is a notable exception) is to explain concentration statistically by a mixture of independent variables that includes some components of the identity and some truly behavioral determining forces. This leads to spuriously high correlations and biased estimates of the behavioral coefficients. We may suppose that concentration is inversely related to the size of the market, because a small market can be served by only a few companies that are large enough to exhaust the available economies of scale. Yet this influence on concentration operates through the number of companies in the market. It would be inappropriate to include size of market and number of companies together as independent forces determining concentration.

We employ a statistical procedure that involves the following steps. First, we examine the identity-type factors underlying concentration, to discover how much of interindustry differences in concentration are due to the differences in these various underlying primary structural characteristics.

Defining concentration as $\underline{C}$, and the dimensions of industry structure that can be related to it via a closed identity as $\underline{C_i}$ then we estimate the functional relation:

$$C = f_1\ (C_1,\ \ldots,\ C_i,\ \ldots,\ C_n). \qquad (1)$$

Second, with this evidence in hand, we proceed to the behavioral determinants of concentration, $\underline{S_i}$, and estimate relations that take the form:

$$C = f_2\ (S_1,\ \ldots,\ S_i,\ \ldots\ S_n) \qquad (2)$$

Finally, we examine the significant relations that have appeared between $\underline{C}$ and the $\underline{S_i}$. The influence of the significant $\underline{S_i}$ on $\underline{C}$ should operate through theoretically identifiable subsets of the $\underline{C_i}$, which we then regress on the appropriate $\underline{S_i}$ to check the inference:

$$C_i = f_3\ (S_i). \qquad (3)$$

Equation 1 can be treated empirically as a regression equation if the variables do not constitute a closed identity, or if some terms of the identity are missing. But it is better handled via correlation analysis if the data themselves are complete and consistent with a closed identity. We define $\underline{S}$ as sales, $\underline{NP}$ as number of plants, and $\underline{N}$ as number of companies; the number 4 after each symbol indicates that it pertains to the largest

four companies (otherwise, the symbol applies to the whole industry). Rosenbluth employed an identity that, written in terms of the four-firm concentration ratio, would be:

$$\frac{S4}{S} = \frac{S4/4}{S/N} * \frac{4}{N}.$$

That is, concentration is decomposed into the relative size of the largest companies and the proportion they make up of the total number of companies. We expand that identity in order to encompass the amount of multiplant operation in the industry:

$$\frac{S4}{S} = \frac{S4/NP4}{S/NP} * \frac{NP4/4}{NP/N} * \frac{4}{N}.$$

The relative size of the largest companies has now been decomposed into the relative size of the largest companies' plants, the relative extent of the largest companies' multiplant operation, and the proportion of the total number of companies that the largest companies form.[4]

In our data base the three terms of the right-hand side of this industry are respectively designated PLSZ, PLCN, and NENT; the first two are defined exactly as in the identity, while NENT is simply the number of companies in the industry. It turns out that four-firm concentration (C468) is negatively correlated with NENT, but also negatively correlated with PLSZ and PLCN. The relevant correlations are shown in Table 7.1.

Table 7.1

	C468	PLSZ	PLCN	NENT
C468	1.0000	-.5242	-.2815	-.5516
PLSZ		1.0000	.0346	.5725
PLCN			1.0000	.5638
NENT				1.0000

It is evident that differences in concentration in Canadian industries must be associated chiefly with differences in the number of companies. With the number of companies held constant, the first-order partial correlation between C468 and PLCN becomes positive but is very small (.043), and the first-order partial correlation between C468 and PLSZ remains negative (-.305). Thus concentration in Canada is not at all associated with differences in the plant sizes of the leading companies, which apparently tend to be more uniform in concentrated than unconcentrated industries. This fact may reflect the pressure in concentrated industries to avoid the diseconomies of small scale, which shrink the number of establishments (and companies) that can occupy the market and at the same time reduce their size inequality. We will find in the next section and in Chapter 11 further indirect evidence of this effect.

BEHAVIORAL INFLUENCES ON CONCENTRATION

THE VARIABLES

The behavioral determinants of concentration in Canada fall logically into two categories. Some are specific to the technology of the industry or to the use of its products, and hence should hold more or less constant for the industry regardless of the country in which we observe it. This class would include not only "outright" technological influences on the conditions of production and supply, but also any technology constraining the channels of distribution and the process of choice of buyers. For example, it is generally costly and difficult for buyers to secure "objective" information on the performance of competing brands of automobile tires; this condition, which tends to support the tire-makers' efforts to differentiate their products, should vary little from one country to the next. As well, it may affect seller concentration in all countries. Other variables influencing concentration are clearly specific to the country and vary greatly among countries. Market size and tariff protection are examples.

Evidently we must control for both sets of variables in order to understand the influence of either. The device we employ is to use the level of concentration in the U.S. counterpart industry as an instrument to control for all the influences on Canadian concentration that are specific to the industry and insensitive to national differences.[5] The United States is the largest industrial country and on balance the one in which new products and technologies have most fully diffused. Thus, its level of seller concentration should both be relatively free of country-specific forces associated with a small market, and also be a leading indicator of the effect of worldwide changes and innovations that are operating on concentration levels in all countries. Finally, although laws in all countries surely affect their industries' levels of concentration, U.S. industries have been somewhat immunized from increases artificially engineered in the pursuit of monopoly profit by laws hostile to monopolization and horizontal mergers. Therefore a key independent variable in our analyses is

US467	Four-firm seller concentration, U.S. counterpart industry, 1967.

Although US467 should control for transnational constant factors in market structure, we expect it to obscure the significance of those partly transnational features that we measure from Canadian data. Therefore US467 might conceal the significance of some Canadian influences on concentration while it reveals others.

Economies of scale are a force of potentially great importance influencing concentration in Canada whether they cause concentration to be high, or whether concentration proves too low to exploit them fully. We lack the direct estimates of these that have been available to a few investigators,[6] and must make do with statistical proxies. A statistical proxy that has commonly been employed for economies of scale in the plant is the variable MESC:

MESC	Shipments per establishment by the largest establishments accounting for (approximately) half of industry employment, divided by total industry shipments.

The problem is that MESC has an identity relation to concentration because it measures shipments concentration in the larger plants (compare PLSZ, defined on page 158). That problem can be partly solved by amending MESC to recognize that it should exert a behavioral influence on seller concentration only when the diseconomies of small-scale plants are important. These diseconomies seem to be reflected, at least roughly, in the variation of value added per worker (productivity) with scale of plant, a datum available from census tabulations. Specifically, we calculate the ratio of value added per worker in the smaller plants accounting for half of employment in the Canadian industry to value added per worker in the larger plants accounting for the balance (CDRC). If this ratio reflected only the shape of the average plant cost curve (but it reflects many other things as well) it should equal one for an industry operating on a flat cost curve and lie proportionally below unity for industries exhibiting plant diseconomies of small scale. This ratio cannot be taken as an accurate estimate of diseconomies of scale, but a low value of CDRC suggests plant economies of scale for the industry in question. Following a previous study,[7] we calculate the following two variables:

MES8 = MESC when CDRC is less than 0.8, zero otherwise;

MES9 = MESC when CDRC is less than 0.9, zero otherwise.

These variables imply that minimum efficient plant scale is a significant influence on concentration only when the cost disadvantage of small plants appears to be large.[8]

A doubt immediately arises about these measures because of the small size of the Canadian economy. The method of estimating minimum efficient plant size assumes that industries' larger plants have achieved efficient scale (if not necessarily just the largest plants accounting for 50 per cent of employment). What if no plants in Canadian industries attain efficient scale, or only small and variable proportions of them? What if other forces affect the viability of small establishments in Canada (as we suggest in Chapter 11)? A possible way to evade these problems is to calculate equivalent variables using data on the U.S. counterparts of the Canadian industries in our sample. These variables are designated MSU8 and MSU9. We also created hybrid variables that use the cost disadvantage estimated from U.S. data (CDRU) to determine the threshold for the importance of economies of scale in Canada (MESC). The resulting variables are designated MUS8 and MUS9.

Because our measures of minimum efficient plant scale are expressed as a fraction of market size, it might seem unnecessary to take the influence of market size into account independently. However, the extent of multiplant development is probably sensitive to the size of the market even if the scale of plants is not (Rosenbluth found that differences in firm size were more important than differences in plant size for explaining differences between Canadian and U.S. seller concentration[9]). Indeed there is considerable evidence that the sizes of both companies and plants vary from country to country with the size of the overall market, although not by enough to keep seller concentration from being inversely related to the size of the national market.

The market size is a proxy for "domestic disappearance":

$$MKSZ = ECA67(1 + IMP - EXP)$$

where ECA67 is the Canadian industry's total employees in 1967 and IMP and EXP are respectively imports and exports (net of re-exports) as a percentage of total shipments.

If market size does affect plant and company size and concentration, the relevant market may not be that measured by domestic disappearance in Canada. Indeed, the openness of the Canadian economy makes us expect that this influence should be irrelevant to the extent that exports make up a large proportion of an industry's shipments or that imports serve a significant fraction of the domestic market. We therefore employ total employment (ECA) as a "base" measure of the scale of an industry's activity but let its relation to concentration take a different slope for industries with differing exposures to international trade. Specifically we define the following:

$$\underline{XECA} = \underline{ECA} \text{ if } \underline{EXP} \geq 10 \text{ per cent.}$$

$$\underline{NXECA} = \underline{ECA} \text{ if } \underline{EXP} < 10 \text{ per cent.}$$

$$\underline{MECA} = \underline{ECA} \text{ if } \underline{IMP} > 20 \text{ per cent.}$$

$$\underline{NMECA} = \underline{ECA} \text{ if } \underline{IMP} \leq 20 \text{ per cent.}$$

The critical values for IMP and EXP are approximately the medians for the population. We also calculated the interaction ECIM, equal to ECA/IMP. Because IMP is a small fraction with a skewed distribution, the effect of this interaction is greatly to inflate activity scale in industries where imports are negligibly low.

If the relevant market can be larger than the Canadian economy, it can also be smaller. Markets smaller than the national economy could constrain the sizes of Canadian establishments and companies tightly, thereby increasing their number and reducing seller concentration when it is measured mechanically at the national level. Therefore we expect a negative relation of concentration to REG, a dummy variable set equal to one if the industry's markets are regionally fragmented. Regional submarkets should exist because of transportation costs, and their influence on concentration in Canada should be similar to their influence on concentration in the geographically dispersed U.S. market. Therefore we expect REG to prove significant only when US467 is not included.

There is a widely observed connection between the size and capital intensity of enterprises, both within industries and across the manufacturing sector. The causality involved is not completely clear, because enterprises choose their scales and factor proportions jointly in response to the market data confronting them. However, if forces in a particular national market favor the adoption of a highly capital-intensive technique, they should also promote larger sizes of enterprise and thereby higher concentration. There are many ways in which Canada's climate, geography, energy sources, and so on, could influence the capital intensity and thereby the concentration of particular industries. Furthermore, if the relative prices of capital and labor in Canada

diverge from those in other industrial countries (in particular, the United States), capital intensities observed in Canadian industries will generally differ from those observed in their counterparts elsewhere, but not by any constant proportion. If relative capital costs in Canada are generally higher than those in the United States, capital intensity in Canadian industries should be lower than that of their U.S. counterpart industries to an extent dependent on each industry's elasticity of input substitution. Our data base contains a rough estimate of relative capital intensity, LAB1, which equals payroll as a percentage of value added in Canada divided by payroll as a percentage of value added in the U.S. counterpart industry. Because the variable is defined as relative labor intensity it should be negatively related to concentration. Because it is defined relative to the U.S. level, it should reveal its influence only when we control for concentration in the United States (where concentration is presumably affected by the level of U.S. labor intensity).

Capital costs also affect concentration in a specific way as a source of barriers to the entry of new competitors to a market. Because this entry barrier can arise only where the capital cost of a new minimum efficient scale plant represents a large absolute sum, the usual statistical proxy for it is the estimated capital cost of a single plant of minimum efficient scale. Minimum efficient scale imposes a lower bound on this cost of entry only where the cost disadvantages to an entrant of smaller scale are substantial. Therefore we impute entry barriers from this source only to those markets in which MUS9 (defined above) takes a nonzero value. Specifically, our variable CAPC approximates the absolute size (sales) of the minimum efficient scale plant (used to estimate MESC) multiplied by the industry's average ratio of assets-to-sales in those industries in which the value of the cost disadvantage ratio for the United States (CDRU) is less than 0.9. The variable should be positively related to concentration.

The effect on concentration of market size, both national and international, is not independent of the presence or absence of product differentiation, if the good is produced subject to any appreciable economies of scale. In a large market, a certain number of "brands" can be profitably produced, some (we assume) at scales larger than necessary to achieve minimum long-run average costs. We now imagine the total size of the market being drastically shrunk, but with no change in the proportional distribution of buyers' preferences regarding the various characteristics of the differentiated product. In the smaller market some brands that were formerly profitable, even if produced at inefficiently small scales, will become unprofitable and disappear from the market. Others that were producing at or above minimum efficient scale will survive at smaller-than-efficient output levels and earn lower profits. Because some brands can survive at scales too small for costs to be minimized, the industry's concentration level does not rise in the shriveled market as much as would that of an undifferentiated industry in which inefficiently small production units cannot permanently survive (because, except for the "marginal" producer, they would either grow or disappear). If advertising outlays as a percentage of sales (ADI) can be taken to indicate product differentiation, this consideration implies a negative relation between concentration and ADI once we have controlled for market size. The prediction cannot be certain, however: as Eastman and Stykolt point out, advertising also contributes to barriers to entry

and through that channel can raise concentration.[10] An extended debate among economists over the causal relation between advertising and concentration in the United States leads us to the conclusion that no relation exists across a broad spectrum of U.S. manufacturing industries but that a positive relation appears in industries where advertising can give rise to barriers to entry. For this reason we employ the variable ADIC, which equals ADI in "convenience-good" industries (see Chapter 3), the only ones in which we expect advertising to supply a basis for raising entry barriers and thereby increasing concentration.

THE RESULTS

It is useful to start by examining the equations in Table 7.2, which contains the U.S. concentration level as a control variable. This is highly significant. The regression coefficient for C468 on US467 is not significantly different from unity, which (with the positive constant term) suggests that Canadian concentration can be predicted rather well by the U.S. value plus a constant. The regression coefficient of C868 on US867, however, is significantly less than one. Eight-firm concentration in many Canadian industries is close enough to 100 per cent that this ceiling becomes a binding constraint for industries with higher levels of eight-firm concentration in the United States.

With U.S. concentration controlled, it is not surprising to find several other variables insignificant, especially the MES variables and REG. CDRU, however, presents us with a considerable surprise by turning out to be significant (in a two-tailed test) with a positive sign. This result does not depend on the inclusion of the U.S. concentration measure; furthermore, if we substitute the Canadian cost disadvantage ratio (CDRC) for CDRU we get an even more significant positive sign. The zero-order correlaton of both CDR measures with concentration in Canada is positive, whereas both are negatively correlated with concentration in the United States. We can explain the positive relation between CDRC and concentration in Canada because CDRC is itself an endogenous variable determined by many identifiable forces, among which technical diseconomies of small scale are not as important (see Chapter 11). But the positive relation to CDRU remains a mystery.

The size of the Canadian market shows the expected negative relation to concentration, though its significance is weak. The interaction with imports, here inverted as imports divided by industry employment, suggests by its sign that close competition on the world market increases concentration, but the coefficient is not significant. There is no relation to advertising.

The evidence of Table 7.2 suggests that concentration in the U.S. counterpart industry perhaps explains too much of Canadian concentration, obscuring the influence of other independent variables reflecting conditions in Canada. Therefore in Table 7.3 we drop the U.S. concentration variable and focus on the influence of market size and exposure to international trade in the Canadian market. The first two equations, identically specified, demonstrate that it makes little difference to the significance of the independent variables whether the dependent variable is C468 or C868 and so only C868 is shown for other specifications. An immediately noteworthy feature of Table 7.3 is the decline in R^2 values; concentration in the U.S. proxies forces not otherwise captured by our independent variables.

First, consider the variables involving market size. In equations 1-3 concentration is negatively related to market size in the industries with little export business (NXECA) but unrelated in the exporting industries (XECA). This difference supports the hypothesis that international trade relieves the constraints on company and establishment size imposed by the scale of the national economy where there is little exposure to trade. The same effect does not work on the import side, however (equation 4): the coefficients of MECA and NMECA vary somewhat in significance as the specifications of the equations are altered, but never differ much from one another; and ECIM is always insignificant. Canada's imports consist of differentiated goods to a much greater degree than her exports, and that fact is sufficient to explain the asymmetry. But it is not necessary, for the roles of tariffs and foreign investment might prove on further analysis to contribute to the explanation.

Advertising rates bore an insignificant negative relation to concentration in the equations reported in Table 7.2. We replaced ADI with ADIC (advertising-sales ratio in convenience-good industries) in equations 3 and 4 in Table 7.3 and were rewarded only with another insignificant negative coefficient. We restricted the sample to consumer-good industries and got no change in either result. It appears, as we suggested above, that advertising bears no simple, direct relation to concentration levels in Canada. Therefore we revised our approach to explore the proposition that advertising's effects on concentration are multifaceted. We allowed the relation between concentration and our minimum efficient scale variables to take different slopes, depending on whether the industry's advertising rate is above or below the average. In equations 1 and 2 the variable ADMU9 and NADMU9 represent the variable MUS9 in high- and low-advertising industries respectively. (MUS9, which appears without the interaction in equations 3 and 4, proved more significant than either of the other minimum efficient scale variables MSU9 or MES9. It thereby leads to the sensible conclusion that Canadian data reveal more accurately the effective minimum efficient scale of establishments in the Canadian market, because it should depend on conditions in the Canadian market; but that the cost disadvantage ratio for the United States is a better indicator of the technological sources of cost elevation at suboptimal scales. These variables give quite different results for C468 (equation 1) and C868 (equation 2).

For C468, the coefficient of NADMU9 is much larger and more significant than that of ADMU9 (that is MUS9 gets a much larger and more significant coefficient in the low-advertising industries), suggesting that the weight of establishment scale in determining concentration is much reduced in industries where advertising and product differentiation are important. Yet this effect is not visible for eight-firm concentration (equation 2). We expect that barriers to entry due to high rates of advertising outlays should inflate the shares of a few dominant firms in certain types of industries, and that conventional economies of scale in the plant would carry reduced weight in determining concentration in those industries. Therefore the difference between equations 1 and 2 does not deter us from tentatively accepting the hypothesis that advertising affects top-end concentration in some industries. In Chapter 11 we present evidence on other effects of advertising and product differentiation to the effect that, other things being equal, they improve the viability of small-scale enterprises in a small

Table 7.2

Regression analysis of determinants of seller concentration, including concentration in U.S. counterpart industry*

Dependent variable	Constant	Independent variables									R^2	Degrees of freedom
		US.67	MESU	CDRU	MUS9	MKSZ	ECIM	REG	LAB1	ADI		
C468	17.1 (.96)	$.996^a$ (5.99)	.442 (.31)	29.4^b (2.22)		-.0002 (-1.02)	.003 (.80)	.680 (.14)	-2.37^b (-2.11)	.790 (.76)	.530	57
C468	43.8 (3.39)	$.935^a$ (6.11)			.229 (.39)	$-.0004^b$ (-1.77)	.004 (1.16)	.621 (.13)	-1.72^c (-1.40)	-.141 (-.13)	.489	58
C868	20.4 (1.07)	$.787^a$ (6.16)	.871 (.63)	29.8^b (2.19)		$-.0003^c$ (-1.38)	.001 (.56)	-2.02 (-.43)	-1.45^c (-1.31)	.077 (.08)	.539	57
C868	47.4 (3.62)	$.714^a$ (5.88)			.442 (.75)	$-.0004^b$ (-2.20)	.003 (.96)	-2.39 (-.49)	-.604 (-.52)	-.940 (-.90)	.502	58

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom. The variable US 67 is US467 is the first two equations, US867 in the latter pair.

national market such as Canada's. Thus, although the statistical evidence is decidedly indirect, we are inclined to agree with Eastman and Stykolt[11] that advertising's effects on concentration in Canada are indeed various, and it is reasonable to expect no simple net statistical effect of advertising rates on concentration.

Another theoretical source of entry barriers, and therefore of high concentration, is a high capital cost of establishing an efficient-scale production unit. CAPC, our measure of this capital requirement, is positive but never significant (equations 1 and 2). In equations 3 and 4, therefore, we tried a variant of this hypothesis. Perhaps capital-cost barriers depend not on the cost of a plant large enough to minimize production costs but on the cost of establishing a company with a market share large enough to be viable given the overall pattern of competition in the industry. In this broadened view, the relevant dimensions of scale can encompass distribution, sales promotion, pooling of activities for risk-avoidance, and many other facets besides unit costs of production. To test this hypothesis we formed the variable CAPSH, which is the product of the industry assets-to-sales ratio (ATS) and MESC the minimum efficient scale estimated from Canadian data and expressed as a share of shipments in the market. While the conclusions must be qualified, because CAPSH has somewhat more built-in correlation with concentration than does CAPC, in equations 3 and 4 this revised formulation proves statistically significant. Two further results can be mentioned. LAB1 is insignificant with U.S. concentration omitted from the equation, as we expected it would be. Also the regional dummy has the appropriate negative sign but is never significant.

DETERMINANTS OF COMPONENTS OF CONCENTRATION

We indicated earlier (page 158) that concentration can usefully be factored into the following components: the relative size of the largest companies' plants (PLSZ); relative multiplant development of the largest companies (PLCN); and the number of enterprises in the industry (NENT). In Table 7.4 we regress each of these variables on the same independent variables as appear in Table 7.3; equations 1, 2 and 3 of Table 7.4 are specified identically to equations 1 (or 2), 3, and 4 of Table 7.3. The size of export-exposed markets has no effect on any component of concentration, but the size of sheltered markets (NXECA) is positively related to both the number of companies (which lowers concentration) and to the relative plant-size and plant-concentration variables (both of which raise it). Thus the negative effect of market size on concentration apparently results because the increased concentration of plant sizes and numbers is more than offset by the increased number of companies. Regionality (REG) apparently fails to show its expected negative effect on concentration in Table 7.3 because of its significant positive relation to the extent of multiplant operation. The failure of our variables MECA and NMECA in Table 7.3 is explained in equation 3 of Table 7.4: in the industries sheltered from imports (which overlap extensively with those sheltered from exports), market size is positively related both to the number of companies and to relative plant concentration, which have offsetting influences on company concentration. ECIM also is significantly related to both NENT and PLCN, with offsetting effects on company concentration.

Table 7.3

Regression analysis of determinants of seller concentration, excluding concentration in U.S. counterpart industry*

Independent variable	Dependent variable			
	(1) C468	(2) C868	(3) C868	(4) C868
MUS9			1.85[c] (2.88)	1.79[a] (2.67)
ADMU9	1.16 (1.27)	1.85[b] (2.01)		
NADMU9	2.09[a] (2.67)	1.81[b] (2.32)		
XECA	.029 (.11)	.075 (.28)	-.082 (-.38)	
NXECA	-.878[b] (-2.12)	-.918[b] (-2.32)	-.825[a] (-2.44)	
MECA				-.505 (-.89)
NMECA				-.237 (-1.13)
ECIM	-4.59 (-.12)	-6.85 (-.18)		
CAPC	.638 (.60)	.779 (.74)		
CAPSH			8.85[a] (2.79)	9.06[a] (2.71)
LAB1			1.16 (.79)	1.44 (.94)
REG	-3.33 (-.46)	-4.55 (-.63)	-3.10 (-.48)	-5.52 (-.79)
ADIC			-.092 (-.71)	-.472 (-.35)
Constant	54.8 (9.85)	69.2 (12.5)	53.3 (3.01)	48.6 (2.63)
R^2	.146	.171	.281	.223
Degrees of freedom	53	53	55	55

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom. Variables XECA, NXECA, MECA, and NMECA have been divided by 1,000 in order to scale them conveniently, and ECIM has been divided by 1,000,000.

Table 7.4

Regression analysis of determinants of components of seller concentration*

Dependent variable	Constant	MUS9	ADMU9	NADMU9	ADIC	XECA	NXECA	MECA	NMECA	ECIM	CAPC	CAPSH	LAB1	REG	R^2
		Independent variables													
1a. PLSZ	5.21		-.259	-.153		.039	.198[b]			.600	-.081			-1.20	.032
	(4.33)		(-1.23)	(-.85)		(-.63)	(2.08)			(.07)	(-.34)			(-.72)	
1b. PLCN	1.46		-.079	-.39		.004	.060[b]			1.35[a]	.85			.951[c]	.470
	(3.29)		(-1.08)	(-.63)		(.19)	(1.80)			(4.30)	(1.01)			(1.61)	
1c NENT	88.5		-14.8[c]	-12.8[c]		-3.95[c]	15.7[a]			222[a]	-2.30			-77.2	.630
	(1.63)		(-1.65)	(-1.65)		(-1.50)	(3.90)			(5.81)	(-.22)			(-1.09)	
2a. PLSZ	5.87	-.216[c]			-.116	-.034	.195[b]					-.780	-.028	-1.57	.061
	(1.37)	(-1.38)			(-.37)	(-.59)	(2.39)					(1.00)	(-.08)	(-.98)	
2b. PLCN	.98	-.073			-.015	.038[c]	.131[a]					-.477[b]	.468	1.20[b]	.281
	(.55)	(-1.13)			(-.11)	(1.54)	(3.85)					(-1.47)	(.31)	(1.80)	
2c. NENT	51.5	-15.7[b]			-9.85	1.38	27.0[a]					-55.1[c]	.734	-16.3	.409
	(.22)	(1.85)			(-.58)	(.44)	(6.08)					(-1.30)	(.04)	(-.19	
3a. PLSZ	7.47	-.196			-.002			.097	.029			9.35	-.131	-.701	-.056
	(1.64)	(-1.18)			(-.01)			(.69)	(.52)			(-1.12)	(-.35)	(-.40)	
3b. PLCN	2.08	-.053			0.22			.019	.066[a]			-.628[b]	-.010	1.32[b]	.202
	(1.10)	(-.77)			(.16)			(.34)	(2.84)			(-1.82)	(-.06)	(1.85)	
3c NENT	321	-.10.9			.928			1.30	8.99			-90.6[b]	-13.9	32.9	.099
	(1.12)	(-1.04)			(.04)			(.15)	(2.53)			(-1.72)	(-.58)	(.30)	

*See footnote to Table 7.3 Each equation has 53 degrees of freedom.

The effect of the straight minimum efficient scale variable (MUS9) is, as expected, to reduce the inequality of plant sizes (PLSZ) by discouraging the construction of small plants, and to reduce the total number of companies, but neither relation is strongly significant. The differential effect of MUS9 in high and low-advertising industries is not apparent in equation 1. Presumably this is because it is not tied to production technology, and therefore can affect these components of concentration quite differently in different industries even if its effects on overall concentration are similar. Advertising rates themselves (ADIC) have no effect on the components of concentration.

CHANGES IN CONCENTRATION

Explaining the level of seller concentration and explaining changes in concentration are, logically speaking, two methods for testing the same set of hypotheses. If a high value of X promotes high concentration, then an increasing value of X should promote increasing concentration. Nonetheless, there are reasons for attacking the determinants of concentration on both fronts. One is that the available data allow different hypotheses to be tested. Another reason, more subtle, has to do with the pace at which concentration adjusts to its putative determinants. A cross-sectional research methodology normally assumes that we observe each entity in equilibrium, or displaced only randomly from it. Yet concentration and most of its structural determinants change very slowly, and it is quite possible that there are systematic gaps between the observed levels of industries' concentration and the equilibrium levels that would emerge if all forces worked themselves out. These gaps could distort our estimates of the relation between concentration and its determinants or, indeed, give false impressions about significant and insignificant influences. An analysis of changes in concentration, though also limited by these same considerations, gives some leverage against them.

Data on concentration in Canadian industries are now available for three years; 1965, 1968, and 1970.[12] Five years (or less) is a short period for analysis. The leading study of concentration changes in the United States covers 23 years.[13] Nonetheless, we can tell whether the period of observation for Canada is too short for analysis only by trying it.

Concentration in manufacturing industries of the major industrial countries has shown no sustained overall trend in the twentieth centry. However, there have been definite trends observed over substantial numbers of years, and we can never be sure that the changes we currently observe do not represent the onset of a "permanent" trend. The evidence for other countries suggests that concentration during the 1960's rose somewhat in the United States and Japan, and rose more sharply in the United Kingdom and the continental European industrial countries. The figures suggest a slight increase in concentration in Canadian manufacturing during the latter 1960's. We examined the change in both the four-firm and eight-firm concentration ratios over 1965-68 and 1965-70. The change in the Standard Industrial Classification, intervening before publication of the 1970 concentration data, reduced the available degrees of freedom more than enough to compensate for the longer period of observation, and so the results we report here are for the 1965-68 period only. The changes in the four-firm and eight-firm concentration ratios are designated CC4 and CC8.

THE VARIABLES

Whether or not average concentration is changing significantly, individual industries' concentration levels may undergo important changes because of changes in their determinants, and these changes may themselves be a matter for public concern. Therefore we proceed to consider the variables that may influence changes in concentration in Canada. One hypothesis that Mueller and Hamm claimed to confirm for the United States is that changes in industries' concentration ratios are inversely related to their initial levels, that is that the variance of concentration ratios is decreasing.[14] Their test is unsatisfying because a well-known statistical bias tends to produce just that result.[15] Nonetheless, the notion that we may identify some "natural" level of concentration toward which an industry tends is not without interest. In Canada's case, a related maneuver involving less of a statistical problem is to relate changes in Canadian concentration to the difference between concentration in Canada and the United States. Concentration on the average is higher in Canada: in 1968 the unweighted average four-firm ratio for a group of Canadian manufacturing industries that we could match to their U.S. counterparts was 52.8, but only 34.7 in the U.S. counterpart sample in 1967; for the eight-firm concentration ratio the figures were 67.5 and 46.7. Nonetheless, the difference varies from industry to industry, and part of that variation may be due to unobserved disturbances that have displaced Canadian concentration from the level to which long-run structural forces are propelling it in both Canada and the United States. Specifically, we construct the variables

DCR4 = C468 - US467

DCR8 = C868 - US867.

which should be negatively related to the dependent variables CC4 and CC8 respectively.

Growth in an industry always seems to be negatively related to concentration[16] because it encourages the entry of new firms,[17] increases the survival rate of small firms relative to large ones and tends to speed the average growth rate of small firms relative to large ones. We include the compound annual rate of growth of shipments over 1961-71, a period starting earlier than the years covered by the change in concentration in order to allow for the time businesses need to make the decision to enter. We expect this growth rate (GSI) to be negatively related to concentration.

Earlier in this chapter we found capital intensity to be related to the level of concentration. Hence we wish to determine whether capital intensity has changed among industries at rates differing sufficiently to affect their concentration. We do not have a direct measure of the change in capital intensity, but we can resort to a proxy that is sometimes used for capital-intensity: relative energy consumption. Specifically, we employ the variable CECT, the change in cost of energy consumed as a fraction of total cost, 1961-71. It should be positively related to the change in concentration.

The potential for increases in an industry's concentration ratio depends partly on the ease of entry by outsiders. We cannot readily measure structural entry barriers, but we can detect the incidence of past entry into an industry by going firms from two variables in our data base that measure the prevalence

of companies diversified into the industry. One is OWN, the proportion of value added originating in establishments belonging to companies classified to other industries. The second is FSE, the proportion of sales accounted for by establishments belonging to companies under 50 per cent or more foreign control. OWN and FSE are not strictly independent figures (some establishments counted in FSE counted in OWN as well, when the owning foreign subsidiary is classified to another industry). Nonetheless, their general similarity warrants combining them into the variable

$$INDV = FSE + OWN.$$

Considerations of ease of entry imply a negative sign for this variable. However, a positive sign could logically suggest that the presence of diversified firms (including multinationals) reduces the entry rate for new firms and/or increases the mortality rate for going firms specialized to the industry.

When we introduced advertising as a percentage of sales (ADI) among the determinants of the level of concentration, we noted that it might indicate a source of entry barriers and be positively related to concentration. Because nationwide television advertising, subject to various kinds of economies of scale, is a development of the past three decades, we expect that this influence may still be working itself out. Indeed, for the United States a powerful relation was found between changes in concentration and a dummy variable indicating high product differentiation detected mainly from high advertising rates in nationwide media.[18] Therefore ADI is included as a possible determinant of changes in concentration, along with ADIC, the advertising-sales ratio for convenience-good industries only. A positive sign is expected. The negative influence of advertising on the level of concentration, discussed earlier, should not affect changes in concentration.

The minimum efficient scale of companies and establishments is largely a technologically determined datum, but not un unchanging one. Shifts in technology, factor costs, transportation costs, and so on, continually change the optimal scale of a new industrial plant. The actual distribution of plant and company sizes presumably changes slowly in response to this changing optimum. We investigated the possibility that changes in concentration include a delayed response to a changed minimum efficient scale of establishments. The efficient scale of establishments should affect seller concentration only if the disadvantages of suboptimal scale are substantial; so the composite variables MES8 and MES9, introduced on page 160 are once again appropriate.

MES8 and MES9 allow us to test the hypothesis that we observe concentration adjusting to the level of minimum efficient scale, but we should also like to know whether concentration is changing because of ongoing changes in economies of scale. We cannot calculate MES8 and MES9 at points sufficiently removed in time, and therefore can test this hypothesis only roughly by including the change in average value added per establishment between 1961 and 1971 (CPVE). This is an unsatisfactory test because concentration and establishment size are related via an identity, as are their changes, and it is possible that average establishment size is pulled upward by forces increasing seller

concentration but unrelated to economies of scale (that is that large companies build bigger plants because some other source of market power allows them to sell goods accounting for an increased proportion of the market). We expect CVPE to be positively related to changing concentration but must remind ourselves that the relation could prove behaviorally spurious.

The same reasoning that supports a relation of changes in concentration to MES8 (MES9) suggests one to CDRC, our proxy for the cost disadvantage of relatively small establishments. Although product differentiation, transportation costs and so on , can make small establishments economically viable even though they cannot minimize production costs, an industry may also contain establishments that operate at a revenue-cost disadvantage and are not viable in the long run. If the variance of CDRC reflects to some degree the varying prevalence of such establishments, it should be (given the variable's construction) negatively related to changing concentration.

THE RESULTS

Table 7.5 summarizes our regression analysis of the determinants of changes in eight-firm concentration between 1965 and 1968 (the results for four-firm concentration are essentially identical). The explained variance is a reasonable 23 per cent in equation 1, which includes the highly significant identity-related varible CVPE, but negligible in the other equations. Although the variance of levels of concentration in the long run is associated mainly with differences in the number of firms in an industry, short-run changes are closely associated with changes in the size of the average establishment. Taking account of changing establishment size also has the effect of bringing out the significant influence of growth. GSI is negatively related to the change in concentration, as we expect, and significant in equation 1, but not in equations 2 or 3, which omit CVPE. The implication is that growth bears a strong relation to changes in the number of companies in an industry, as Orr has reported.[19] The change in capital intensity (CECT) is significant in equations 2 and 3. However, it is collinear with CVPE and becomes insignificant when they are included in the same equation. Therefore its coefficient is probably biased upward in equations 2 and 3.

The hypothesis that changes in Canadian concentration move to eliminate distortions in the Canada-U.S. differential is not supported, because DC8 is positive and insignificant. The variable C868 enters positively into the definitions of both DC8 and the dependent variable, and this fact suffices to explain the positive relation between them. Similarly, we find no evidence that minimum efficient scale exerts a systematic pull on concentration levels: MES8 is insignificant in equation 1, and other versions of the minimum efficient scale variable are also insignificant and often have inappropriate negative signs. The cost disadvantage ratio, CDRC, is wrongly signed and indeed significant at 10 per cent in a two-tailed test. This result is consistent with the pattern we have found elsewhere (see earlier in this chapter and Chapter 11). The emergent interpretation of this variable is that CDRC is high in relatively concentrated Canadian industries in which economies of scale or other forces push companies toward relatively similar levels of revenue productivity (whatever the dispersion of their sizes). If this interpretation is accepted, the positive sign of CDRC in equation 1 becomes appropriate. Finally, our variable for ease of entry by established firms (INDV) is quite insignificant.

Table 7.5

Regression analysis of determinants of changes in eight-firm seller concentration, 1965-1968*

Independent variable	Equation (1)	(2)	(3)
DC8	.033 (1.13)	.024 (.75)	
CVPE	2.75[a] (3.89)		
CECT		4.57[c] (1.37)	4.81[b] (1.71)
GSI	-45.0[b] (-2.46)	-5.96 (-.31)	-4.38 (-.27)
INDV	-.007 (-.24)	.004 (.11)	-.003 (-.11)
MES8	-.109 (-.58)		
CDRC	7.81[b] (1.89)		
ADI	.292 (1.18)	.231 (1.07)	
ADIC			.061 (.31)
Constant	-7.00 (-1.95)	1.15 (.59)	2.08 (1.42)
R^2	.235	.009	.006
Degrees of freedom	43	44	52

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom.

The positive relation that Mueller and Hamm found between product differentiation and long-run changes in concentration in U.S. manufacturing[20] receives very weak confirmation in equations 1 and 2. The strength of the result must be discounted further because in equation 3 the coefficient of ADIC does not exceed its standard error, although we should expect the effect to be strongest in the convenience-good industries to which ADIC pertains.

NOTES TO CHAPTER 7

1. See Pryor (1972).

2. Rosenbluth (1957).

3. *Ibid*.

4. Other forms are possible. Scherer (1975), concentrating on the extent of multi-plant operation, employed

$$\frac{S4}{S} = NP4 * \frac{S4/NP4}{S}$$

He points out the confusion that resulted from Ralph Nelson's (1963) use of

$$\frac{S4}{S} = \frac{NP4}{NP} * \frac{S4/NP4}{S/NP}$$

Nelson interpreted the first term, the largest companies' proportion of the industry's plants, to reflect multi-plant operation, but it also captures variations in the total number of companies (and therefore plants) in the industry, and combines the effects of the two dimensions of concentration.

5. This device was used, with apparent success, by Caves and Uekusa (1976) in studying concentration in Japan.

6. Bain (1956), Eastman and Stykolt (1967), and Scherer *et al*., *op*. *cit*. The latter two studies deal with or include Canadian markets.

7. Caves, Khalizadeh-Shirazi, and Porter (1975).

8. The cutoff points are arbitrarily chosen, but on the basis of a previous study, in which this device succeeded in avoiding the high correlation between the minimum-efficient-scale estimate and other structural variables, thereby clarifying their respective influences on industries' profitability. *Ibid*.

9. Rosenbluth, *op. cit*.; Eastman and Stykolt, *op. cit*., Chap. 4.

10. Eastman and Stykolt, *op. cit*., Chap. 1.

11. Eastman and Stykolt, *op. cit*.

12. Time and resources have not been adequate to allow us to incorporate Rosenbluth's (*op. cit*.) data for 1948 in the analysis.

13. Mueller and Hamm (1974).

14. *Ibid*.

15. Prais (1958).

16. Mueller and Hamm, *op. cit*.

17. Orr (1974).

18. Mueller and Hamm, *op. cit*.

19. Orr, *op. cit*.

20. Mueller and Hamm, *op. cit*.

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Chapter 8

CORPORATE CONCENTRATION AND ITS SOURCES

R.E. Caves

Because of the Commission's concern with the large corporation in the Canadian economy, it would be desirable to explore the overall size distribution of companies and the degree to which it results from seller concentration in industrial markets (analyzed in Chapter 7), diversification (Chapters 4-6), and other forces. Our data base is not suited for that task, but it does permit an analysis of the total size and related characteristics of 125 large manufacturing companies (see Appendix A). In this chapter we explore selected determinants of their size and growth and relate these determinants to certain traits of their performance.

SOURCES OF CORPORATE SIZE

Large companies account for a substantial portion of the activity in Canada's manufacturing sector. In 1970 the largest 100 manufacturing enterprises accounted for 47 per cent of the value of manufacturing shipments, 45 per cent of value added, and 37 per cent of total employees. The concentration of shipments and value added apparently declined a little between 1965 and 1970, but the concentration of employment may have increased.[1] Concentration of the largest companies in Canadian manufacturing exceeds that in the United States, where in 1970 the largest 100 manufacturing companies accounted for 33 per cent of value added by manufacture and the largest 200 for 43 per cent. Still, the comparison may overemphasize concentration in Canada because the largest 100 corporations make up a much larger fraction of all manufacturing companies in Canada than in the United States, and it appears that the largest x per cent (any arbitrary small number) of companies in Canada account for a smaller proportion of manufacturing value added than does the same percentage of the largest U.S. companies.

As we explore differences in the size of companies we immediately face the same problem of methodology that arose in Chapter 7. A company can be large because of the various components of its overall size: it operates in large markets; it operates in many markets; and/or it holds large shares of those markets. These sources of size can be related to one another through identities. We can determine how the terms vary one with another, but we cannot tell anything (from the identity itself) about causal relationships. Behind these identity variables lie behavioral variables that influence the size of companies through one or more of these components of size. Our analysis of behavioral determinants of these components has already been presented: companies' diversity was explored in Chapter 5, seller concentration in Chapter 7, and the remaining component, size of markets, is not economically interesting to explore.[2] The task of this section is to determine the relative contribution of the identity components to variations in size among Canada's largest companies.[3]

It is not clear what dimension of company size holds the greatest interest for public policy--total assets, sales, employees, or something else. Arbitrarily we choose total assets, averaged over 1961-74 or such shorter period for which data are available. We shall develop several relations involving

variables in our data base that use the properties of identity relations although they do not constitute closed identities. We shall examine the contribution of each variable and the overall explanatory power of the ingredients in each relation, although the identity components make it inappropriate to interpret tests of significance of the regression coefficients in the usual way. The alternative relationships are distinguished principally by whether they concentrate on the company's base industry or on the average characteristics of all industries in which it operates. First, suppose that the size of the company in our sample were, except for its diversification, typical of companies in its base industry. In that case the following relations would hold:

$$DE3*TOTA = (ECA67/NCA67)NPC*CAP$$

$$TOTA = \frac{(ECA67/NCA67)NPC*CAP}{DE3}$$

where TOTA is total assets of the company, ECA67 total employment in its base industry in 1967, NCA67 is total number of establishments in that industry in 1967, NPC is the average number of establishments per company, CAP is assets per employee in that industry (1/LAB2C in our data base), and DE3 is the fraction of the company's employment in its base industry. Apart from the fact that the large company in our sample is surely not typical of companies in its industry, the relation will not hold empirically as an identity because of inconsistencies in the measurement of the variables. We take logarithms of all variables and estimate equation 1 of Table 8.1. All equations in the table contain beta coefficients rather than the actual regression coefficients reflecting natural units of the variables. The term representing size in the base industry contributes substantially to explaining the variance in asset sizes of our large firms, but the diversificaton term contributes very little (the CAP term could not be included because of a deficiency in the data base). In equation 2 we bring this relation a bit closer to an identity by including the logarithm of CVC, the coefficient of variation of the largest eight companies classified to the firm's base industry. Because our sampled companies are generally the leading ones in their base industries, we expect CVC to provide a rough approximation to the leaders' divergence from average large-company shares in their base industries. In equation 2 (Table 8.1) the beta coefficient of CVC is indeed .354, although smaller than the contribution of the term representing average company size (.459). In equation 3 we take a different approach to company size and market by using total market size (ECA) and the conventional four-firm concentration ratio (C468). Concentration in the company's base industry contributes very substantially to explaining company size (.643) although market size is also important (.489); in equation 3, the increased beta coefficient of the measure of base-industry specialization, DE3, suggests that diversification interacts statistically with market size and/or seller concentration.

In the remaining equations of Table 8.1 the attack is shifted from terms characterizing the company's base industry and seller concentration therein to terms describing the weighted-average characteristics of all the industries in which it operates (the weights are fractions of its employees engaged in those industries--see Appendix A) and the number of activities that it carries on (NS). In equation 4 the weighted-average industry variables (symbols preceded by W) are industry size measured by employment (WECA), concentration (WC468),

and capital intensity (WCAP, which equals 1/WLAB2C in our data base). Looking at the variance of companies' sizes in this way, market size and concentration both take on smaller roles than in the case of the company's base industry. Capital intensity matters a good deal (.428) and diversity carries more weight than it did in equations 1-3 (.213). Equation 5 adds the weighted-average value of CVC, which turns out to be collinear with other variables and therefore shifts the beta coefficients around. WCVC does not itself make a substantial contribution, but it elevates the apparent influence of market size (WECA) and the number of markets in which the company operates (NS).

It is difficult to draw any general conclusions about these results beyond the message of the beta coefficients themselves. Market size, concentration, and diversification all make their contribution to the sizes of large companies in Canada (diversity especially when it is looked at as the number of industrial activities [NS] rather than the fraction of employment outside the base industry [1 - DE3]).

One factor in the size of companies omitted from Table 8.1 is the extent of multiplant operation. For several reasons we reserved it for separate analysis. While some have to do with characteristics of the data base,[4] it also seemed important to examine multiplant operation in Canada within a transnational comparative context. For 64 industries we developed data for Canada (1968) and the United States (1967) on the number of single-industry companies (single or multiplant) and the plants belonging to them, as well as the number of multi-industry companies and plants belonging to them (both within and outside the primary industry).[5]

A surprising conclusion of Rosenbluth's study of industrial organization in 1948 was the companies in Canadian industries on the average differ little from companies in their U.S. counterpart industries in either absolute size or the inequality of sizes between an industry's large and small companies. The higher level of seller concentration in Canadian industries, he found, was due to the smaller number of companies that could be accommodated to the smaller economy.[6] Our data gathered 20 years later lead to similar conclusions. There is no difference between the mean number of plants per single-industry company in the two countries (see Table 8.2, line 3), although the number of companies and plants in the average U.S. industry is much larger. There is only a 10 per cent difference between the number of primary plants (that is classified to the same industry as the parent company) of multi-industry companies that also operate plants in other industries, as shown in line 7. Also, multi-industry companies are slightly less numerous relative to single-industry companies in Canada than in the United States (Table 8.2, line 5). The only marked difference in the summary statistics for the two nations' industries comes in the proportion of multi-industry companies' plants that are classified to other industries; the proportion for the United States (78 per cent) is significantly higher than the Canadian proportion (55 per cent) at the 1 per cent confidence level. Thus, insofar as U.S. companies exceed the size of Canadian companies through multiplant development, it is only through the possession of more plants classified to other industries. Aside from the lesser prevalence of diversified plants in Canada, the only difference between the two nations' industries lies in the total number of companies and plants.[7]

Table 8.1

Relation between total assets and components of company size, large manufacturing companies*

	Regression equation	R^2	Degrees of freedom
1.	$\underset{}{LTOTA} = \underset{(3.53)}{0.385} \log\left(\frac{ECA67*NPC}{NCA67}\right) - \underset{(-0.64)}{0.070} \log DE3$	0.172	79
2.	$LTOTA = \underset{(4.42)}{0.459} \log\left(\frac{ECA67*NPC}{NCA67}\right) + \underset{(3.56)}{0.354} \log(CVC) - \underset{(-1.09)}{0.112} \log(DE3)$	0.288	78
3.	$LTOTA = \underset{(4.82)}{0.538} \log(ECA67) + \underset{(5.87)}{0.643} \log(C468) - \underset{(-1.91)}{0.180} \log(DE3)$	0.358	78
4.	$LTOTA = \underset{(3.50)}{0.132} \log(WECA67) + \underset{(2.69)}{0.275} \log(WC468) + \underset{(4.81)}{0.428} \log(WCAP) + \underset{(5.08)}{0.213} \log(NS)$	0.534	77
5.	$LTOTA = \underset{(3.46)}{0.358} \log(WECA67) + \underset{(1.98)}{0.303} \log(WC468) + \underset{(4.67)}{0.424} \log(WCAP) + \underset{(5.05)}{0.414} \log(NS) - \underset{(-0.24)}{0.031} \log(WCVC)$	0.534	76

*Beta coefficients are shown instead of the conventional regression coefficients, and t-statistics appear in parentheses beneath them. R^2 values are not corrected for degrees of freedom. LTOTA is the logarithm of TOTA.

Table 8.2

Statistics on multi-plant operation, 64 Canadian and United States industries, 1967-1968*

	Mean Value		Correlation
	Canada	United States	
1. Single-industry companies (SIE)	202.8	1382.2	0.855
2. Primary plants of single-industry companies (SIP)	210.4	1434.1	0.862
3. Primary plants of single-industry companies, per single-industry company	1.04	1.04	0.769
4. Multi-industry companies (MIE)	6.6	49.1	0.349
5. Multi-industry companies, proportion of single-industry companies	0.033	0.036	0.927
6. Primary plants of multi-industry companies (MPP)	16.4	135.7	0.496
7. Primary plants of multi-industry companies, per multi-industry company	2.48	2.76	0.362
8. Diversified plants of multi-industry companies (MDP)	20.4	477.7	0.318
9. Diversified plants of multi-industry companies, proportion of total plants of multi-industry companies	0.554	0.779	0.288
10. Total number of plants belonging to companies classified to industry	247.2	2047.5	0.861
11. Total number of companies classified to industry	209.4	1431.3	0.856

* Data sources for lines 1,2,4,6, and 8 are given in Appendix A under symbol shown in each entry. Figures shown in lines 3,5,7, and 9 are ratios of means (not means of ratios), computed from unrounded data, and correlations computed across ratios for individual industries.

Table 8.2 also contains the correlations between measures for the individual industries. All are significant at the 5 per cent confidence level. The lowest correlation is between the diversified proportions of multi-industry companies (line 9). This result confirms the analysis of the preceding paragraph and suggests that diversification by multi-industry companies is much less closely tied to characteristics of their base industries than is the extent of multiplant development within the industry.[8]

EFFECTS OF COMPANY SIZE AND DIVERSITY: STABILITY AND GROWTH OF SALES

Many questions can be raised about the economic effects of the size and diversity of the largest companies in a nation's manufacturing sector. This section deals with their effects in two areas: the stability and rate of growth of companies' sales. The effects of size and diversity on components of the cost of capital are considered in Chapters 9 and 10.

INSTABILITY OF COMPANIES' SALES

The process of sorting out the social benefits and costs of large-size companies is a complex one. Ultimately a political valuation must be placed on whatever disutility the society derives from the concentration of control over decisions, and this disutility (if any) must then be weighed against the net favorable economic effects of corporate size and diversity (again, if any). But before we reach that stage, the many possible economic effects of corporate size must themselves be measured, and a balance struck somehow between the favorable and unfavorable ones.

One of the alleged benefits of the diversified or conglomerate company is that its activity is more stable over time. If its suppliers of capital cannot themselves diversify costlessly, stability achieved through a company's diversification may provide a social benefit that is reflected in a lower supply price of capital (see Chapter 9). Therefore we wish to determine whether diversification reduces the variability of companies' financial flows. From data on 115 large companies we calculated the standard deviation of sales around their trend value for the years 1961-74 at the outside (a shorter period, in some cases). That magnitude, SDS, is the dependent variable in the following analysis.

We can control for several other influences on SDS in order to isolate the effect of output diversity. The stability of a company's sales surely depends on the stability of total sales in its various markets. This is measured by WSSI, where SSI is the standard deviation of industry sales around their trend for each industry in which the firm operates, weighted by its estimated employment in those industries.[9] Because the instability of sales (SSI) and the growth rate of industry sales (GSI) are highly correlated (and their mean values approximately equal), we expected that their sum might better control for the general instability of the market situations in which the firm operates. Therefore we used the variable

GSSS = WSSI + WGSI

It should of course be positively related to SDS.[10]

The stability of sales for the firm and its market are each determined by disturbances to both demand and cost conditions and the correlation between them, in a complex way that cannot be modeled fully with the information at hand. We shall, however, include a few of the relevant variables. Finished-good inventories permit sales to vary without imposing the costs of a destabilized rate of production, and so larger average inventories should be associated with a higher variability of sales (since the causation runs both ways, the estimated regression coefficient cannot be attributed any predictive value). We formed the variable FIN, inventories of finished goods as a percentage of total inventories. This variable concentrates on the composition of total inventories in order to avoid the causation running from the instability of sales to the level of total inventories relative to sales. WFIN is the weighted average of FIN over the industries in which the firm participates.

Export shipments are often said to be particularly risky and unstable, and in Chapter 5 we noticed some evidence that companies so view them. Although export shipments are part of total industry shipments, so that their variation is reflected in variable GSSS, it seemed worth forming the interaction variable

GSX = GSSS*XD,

where XD is a dummy variable set equal to one where WEXP (weighted-average exports as a fraction of sales in the firm's industries) is greater than 0.10 zero otherwise. The coefficient of GSX should be positive.

The instability of a company's sales may be related to the extent of its fixed costs. The possible connections are various, but one seems particularly likely. The large companies in our sample typically hold large shares in concentrated markets, and so are likely to recognize some oligopolistic interdependence with their rivals. Fixed costs are generally thought to complicate the process of reaching and (in particular) maintaining an oligopolistic consensus. This is because they widen the margin between price and short-run marginal cost when the rate of production lies below full capacity. This gap tempts the firm to employ competitive maneuvers that divert sales away from its rivals and complicate the maintenance of a consensus on price. Defections (its own or others') tend to destabilize the company's sales, and so noncurrent assets as a fraction of sales (FFS) should be positively related to the instability of sales.[11]

Finally, we include the independent variables that serve to test our main hypotheses. Total size of the company is represented simply by its total assets, expressed in logarithms (LTOTA). A large company is expected to experience greater stability in its sales because it can average out fluctuations attributable to its many different activities; so SDS's relation to TOTA is expected to be negative.[12] This conventional hypothesis about the effect of size, though, is really one about the probable diversity of the large company's activities. Therefore we are curious as to whether size and instability are negatively related after we take account of diversification directly. That is done by inserting any of the diversity measures defined in Chapter 4 (NS, DE3, DE4, DH, DC, or DW).

Table 8. 3

Regression analysis of determinants of variability of large companies' sales (SDS)*

Equation no.	Constant	Independent variables									R^2	Degrees of freedom
		GSSS	GSX	WFIN	LTOTA	FFS	VDE3	VDE4	DH	DC		
1.	0.0257 (0.84)	0.166 (0.70)	0.326^b (2.17)	-0.001 (-0.04)	-0.010^b (-2.35)	0.023^c (1.37)	0.021 (0.80)				0.051	108
2.	0.009 (0.31)	0.345^c (1.53)		-0.012 (-0.37)	-0.007^b (-1.74)	0.027^c (1.61)	0.023 (0.86)				0.018	109
3.	0.021 (0.68)	0.175 (0.74)	0.328^b (2.19)	-0.003 (-0.09)	-0.010^a (-2.38)	0.025^c (1.48)		0.028 (1.07)			0.055	108
4.	0.019 (0.60)	0.180 (0.76)	0.332^b (2.22)	-0.004 (-0.14)	-0.011^a (-2.41)	0.024^c (1.41)			0.027 (1.17)		0.057	108
5.	0.024 (0.78)	0.163 (0.69)	0.330^b (2.19)	-0.000 (-0.01)	-0.010^a (-2.31)	0.023^c (1.37)				0.007 (0.84)	0.051	108

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom.

The regression analysis is shown in Table 8.3. Let us consider the main hypothesis first. The expected negative relation of sales instability to total size appears and is significant at 5 per cent or better. With total size controlled, however, none of the diversity measures contributes to stabilizing the company's sales. Indeed, the regression coefficients are positive with _t_ values that sometimes exceed one. This perverse result cannot be blamed on collinearity between diversity and size, because the diversity variables are positively but not highly correlated with LTOTA, and the correlations between SDS and the diversity measures appearing in Table 8.3 are positive although very low. Our compound variable controlling for environmental stability, GSSS, is positive and weakly significant where GSX is omitted, but otherwise insignificant. GSX, however, is significant at the 5 per cent level, and we conclude that large companies are more vulnerable to the instability of their market environment in export industries.[13] No relation whatsoever is observed between inventories and the stability of sales, but our hypothesis about the relation between fixed costs and the stability of sales is supported by a weakly significant positive coefficient of FFS.

The lack of relation between diversity and stability is surprising, though it is consistent with other evidence. Bond (1974) found for large U.S. companies that risk and diversity were unrelated after size was controlled. For Canadian companies, the variability of profits is a positive but insignificant influence on diversification (see Table 5.2), and our industry-level measures of outbound diversity are uncorrelated with the variability of industry shipments (SSI). Two comments may help to explain the lack of an observed relation. Statistically, we measure our dependent variable (SDS) in such a way that it is increased by mergers that a company might have undertaken to increase the long-run stability of its sales, and this could obscure the hypothesized negative relation. Second, because a company must expect to hold its diversifying assets for a substantial period of time, the risk-spreading value of diversification may not be apparent in smoothing the short-term intertemporal fluctuations of sales, which in any case will be predictable for some companies.

The significant relation between company size and stability also requires a comment, lest it be taken to imply too much. More stable sales for large companies do not necessarily mean that greater stability of general economic activity would result if company sizes were enlarged. The stability of large companies' activities might, for example, be attained in ways that destabilize the sales of smaller companies.

GROWTH OF COMPANIES' SALES

The growth rates attained by large companies bear a relation to the economy's performance that is even less clear than the stability of their sales. We give good marks to fast growth by a company that applies its special skills successfully to a series of markets, bad marks to a company that squanders its resources becoming a go-go conglomerate at a cost to its efficiency. Despite this ambiguity, some of the possible connections between the growth rates of the large companies and the structures of their economic environments hold general interest and will be analyzed here. We focus on two questions: (1) how closely is the present-day output diversity of large companies related to their recent growth rates? (2) is growth a self-fulfilling matter, so that the big companies get bigger?

We employ a regression analysis that uses as a dependent variable the annual growth rate of sales computed by regressing the logarithm of sales on time over 1961-74 (or a shorter period, if required by data limitations). It is important to control for the growth opportunities provided by the company's market environment, and so we include both the growth rate of its base industry over 1961-71 (GSI, calculated the same way as GRS) and the average growth rates of all markets in which the company participates, weighted by its employment allocated to each market (WGSI).

Our indexes of companies' output diversity pertain to conditions in recent years (see Chapter 4). Hence, when we regress growth rates over 1961-74 on a measure of diversity attained by the end of that period, we are asking to what degree growth was apparently attained via diversification during those years. Our data provide no control for diversity at the start of the period. If we find that companies more diversified ex post grew faster, we cannot say whether they attained diversity along with fast growth, or whether initially high diversity fostered their growth during the period. One partial check is available, however, because we observe the same indexes of output diversity for the company included in the data base and for all companies classified to its base industry. Our diversity variables in this analysis thus will be the difference between the diversity index for the company and that for its base industry. We designate differential diversity for the Herfindahl measure of diversity as

$$DDH = DH - DHI,$$

where DH is the observation for the company and DHI for its base industry. Equivalent differentials were calculated for the other five company-specific diversity measures introduced in Chapter 4 (NS, DE3, DE4, DW, DC). To our surprise, the mean value of each of these measures of differential diversity turned out to be slightly negative for the 71 companies covered in this analysis. The result is unexpected because of the positive intraindustry relation between companies' size and diversity reported in Chapter 4.

Other variables were added as rough controls for environmental influences on companies' growth rates. During the period 1961-74 the external value of the Canadian dollar exhibited a generally rising trend as market forces eliminated the undervaluation inherent in the exchange rate of U.S.$.925 per Canadian dollar, the pegged value that was selected in 1962 following the "Coyne episode".[14] Firms based in export industries therefore faced a virtual impediment to their growth over most of this period, those competing with imports an encouragement. We might expect to find a negative relation between growth and

$$NEXP = EXP - (IMP/1 + IMP - EXP)).$$

Net export (NEXP) is the difference between exports as a fraction of output and imports as a fraction of domestic disappearance.

Another central variable in the analysis is the logarithm of the total size (assets) of the company (LTOTA). TOTA is averaged over the same years for which the dependent variable (GRS) is calculated so that the two variables should not be spuriously connected (because the faster-growing company ultimately gets bigger). We expect a negative relation because the maximum feasible growth

rate appears to diminish with the company's absolute size, and previous studies of company growth and survival covering a wide range of company sizes have generally found that small companies that survive grow faster than large companies, this fact being consistent with a stable overall size distribution of companies because the mortality rate for small companies is higher. Assuming that our sampled companies are representative of large enterprises, a positive coefficient of LTOTA would suggest rather strongly that concentration of the largest companies is increasing. The predicted negative sign, however, is consistent with a decreasing, stable, or even increasing concentration of companies.[15]

The growth of large companies should be retarded in industries where market growth is easily captured by new entrants. Orr found weak evidence that market growth and the rate of entry of new firms are related in Canadian manufacturing industries.[16] Our data base does not include the flow of new entrants but does offer two variables that should be related to them. One is OWN, a "stock" measure of inbound diversification into the company's primary industry (OWN's role as an indicator of entry by established firms was analyzed in Chapter 5, Table 5.3). Because the significance of this influence should be apparent only in fairly concentrated markets, we also used the interaction of OWN with seller concentration in the following form:

$$COWN = OWN*C468^{1/2}$$

Both OWN and COWN should be negatively related to the growth rates of large companies.

Another variable that should be related to the entry of new firms and the success of smaller ones is CDRC, the cost disadvantage of small establishments in Canadian industries. The greater this disadvantage (that is the smaller is CDRC), the more easily should large companies be able to seize whatever opportunities for growth are created by the growth of the market. Because CDRC reflects many influences other than the technical cost disadvantages of small establishments, we also employed the equivalent variable calculated from U.S. data, CDRU. Both should be negatively related to GRS.

Finally, we included a crude measure of the real efficiency of the company's base industry, in the sense of comparative international advantage. It is RPR, value added per employee in the Canadian industry divided by value added per employee in its U.S. counterpart industry, 1967. If RPR satisfactorily measured real comparative advantage, and if Canada's export industries traded as pure competitors on the world market, RPR in its base industry should be positively related to a company's growth.

The main surprise contained in Table 8.4 is the lack of significant relation between a company's growth and the growth of the manufacturing industries in which it operates. The relation between a company's growth and the growth rate of its base industry (GSI, not shown in the table) is even farther from statistical significance. This curious result might be due to deficiencies in the data, although neither of the two known to us seems important: GRS covers a slightly longer period (1961-74 versus 1961-71 for GSI and WGSI), and it includes the company's nonmanufacturing activities

Table 8.4

Regression analysis of determinants of companies' rates of growth of sales*

Equation no.	Constant	Independent variables									R^2	Degrees of freedom
		WGSI	LTOTA	OWN	COWN	CDRC	CDRU	RPR	NEXP	DDC	DDH		
1.	.159[a] (3.68)	.078 (.18)	-.011[c] (-1.68)								.088[b] (1.99)	.046	67
2.	.183[b] (1.92)	.031 (.06)	-.013[b] (-1.28)	-.0004 (-.47)		.051 (.81)		-.007 (-.84)	.004 (.10)		.107[b] (2.16)	.016	63
3.	.175[b] (1.81)	.173 (.40)	-.014[b] (-2.05)		-.0005 (-.60)		.084 (1.04)	-.010[c] (-1.40)	.006 (.15)		.091[b] (1.99)	.034	68
4.	.197[b] (2.08)	.036 (.07)	-.014[b] (-1.87)	-.0005 (-.58)		.046 (.75)		-.007 (-.90)	.005 (.11)	.427[b] (2.24)		.021	63
5.	.185[b] (1.91)	.163 (.38)	-.015[b] (-2.14)		-.0006 (-.70)		.083 (1.03)	-.011[c] (-1.44)	.006 (.16)	.373[b] (2.09)		.040	68

*Levels of significance (one-tailed test) are: a = 1 percent; b = 5 percent; c = 10 percent. R^2 values are corrected for degrees of freedom.

(omitted from the other variables, which deal only with manufacturing industries). With company growth unrelated to industry growth, it is unsurprising that the overall explanatory power of the equations in Table 8.4 is negligible.

Company growth is inversely related to average total size among our sample of large companies, so that there is no positive evidence of increasing company concentration. But growth is positively related to all of our measures of differential diversity (between the company and all companies classified to its base industry). Only the Herfindahl (DH) and concentric (DC) indexes are shown in the table, but all give the same result except for NS, the number of activities in which the company's manufacturing establishments are engaged.[17] It is clear that the faster-growing Canadian companies over 1961-74 had attained more diversity by the end of the period.

The remaining variables all perform poorly. OWN and COWN representing inbound diversification, are negatively related to growth as expected, but the relation is not significant. NEXP is quite unrelated to growth, and hence proves unnecessary as a control. More curiously, relative productivity (RPR) is negatively related to growth and marginally significant. We have no explanation except that RPR includes a good deal besides differences in total factor productivity, as becomes clear from the analysis of Chapter 11. Similar to RPR, CDRC and CDRU are incorrectly signed. In the case of CDRC, at least, this result seems to reflect its tendency to take a high value in relatively concentrated industries where most sellers exhibit about the same average level of revenue productivity, whether or not they are all efficient in the sense of minimizing attainable costs.

CORPORATE STRATEGY AND MARKET ENVIRONMENT

The sizes of leading corporations are not the only feature that is influenced substantially by their market environments. The organizational forms that they choose also reflect the constraints and opportunities imposed by the ambient markets, and these organizational choices in turn affect the company's short-run reactions to changes in the market environment, that is whether and how it perceives these changes and how it reacts to them. Because the company's "reflexes" depend on its organizational choices, the allocation of the economy's resources can also be affected by them, and the causes and consequences of this process of organizational choice become a potentially important linkage for the determination of market performance.

The analysis sketched in the preceding paragraph builds on the concept of corporate strategy developed by students of business organization. Chandler first showed how the organizational structures of large corporations have developed historically in response to changes in their market environments.[18] Rumelt, building on the work of Wrigley, showed that the strategies of major corporations could be classified into a simply taxonomy and conclusions drawn about the significance of their various strategic choices.[19] In a detailed case study Bower explored the way in which organizational choices influence the decision-making process of the firm.[20] The shortcomings of this literature, in our view, lies in its failure to ascertain whether strategic choices exert important exogenous influences on the firm's allocative decisions, and thereby on the performance of the market system. Consider,

for example, the conclusion that companies diversifying extensively into unrelated activites are less profitable than those whose diversity employs and builds on the business's strengths in its "basic" activities.[21] It has been reached with little or no control imposed for differences in the base industries from which the sampled companies departed on their routes to diversification. It might be that the unrelated diversifiers were stuck in industries that provided them with no strengths (that is, intangible or other transferable assets) that could be used profitably in other sectors; for them diversification would be only a way to arbitrage capital from low-return to high-return uses. On the other hand, diversifiers into related activities might owe their success to having initially prospered in a setting where they could accumulate intangibles usable for "related" diversification. In general, it might be that strategic choice is totally determinate: if every company made the best choice it could under the circumstances (or, at least, a choice as good as every other company's), strategic choice could itself exert no detectable influence on the results of companies' activities.

But strategic choice may not be totally determinate, certainly not as to its timing. It may depend on executive whim, the occurrence of reverses that make an inferior strategy's shortcomings convincingly apparent, and so on. In that case strategic choice would become an independent influence, not only on the company's performance but also on that of the economy. The public would have a concern with companies' strategic choices.

DIFFERENCES IN CORPORATE STRATEGY AND ENVIRONMENT

We were able to investigate these issues by means of a classification recently completed by Professor Leonard Wrigley[22] of the strategies employed between 1961 and 1972 by 86 large companies in Canada. Of these, 58 are included in the sample of 125 large manufacturing firms that constitutes our company data base. The 58 were distributed as follows among the categories of corporate strategy employed by Wrigley:

Single product	9
Dominant product	24
Related product	23
Unrelated product	2

Generally speaking, these categories represent increasing degrees of diversification and take account of the same parameters of the distribution of a company's activities as do the continuous indexes of diversity that we introduced in Chapter 4. But the classification of strategies goes beyond the mechanical measurement of diversification in taking judgmental account of the ways in which a company's diversified activities are related to each other and to its principal or base activity.

A few points need to be made concerning our sample of 58 companies and the strategies assigned to them. Fifteen of these companies were determined by Wrigley to have changed their strategies between 1961 and 1972, eleven from single to dominant product, three from dominant to related, and one from

dominant to single. In this exploratory investigation we classified each of these companies to the category that it occupied for the majority of the period covered by our financial data on these companies (1961-74).[23] There has been a trend in the last two decades, evident for the United States and United Kingdom as well as Canada, for large companies to shift their strategies from single product and toward unrelated product, with the percentages in the other categories changing in no clear way.[24]

In order to explore these strategic choices we simply calculated means and standard deviations for a number of variables in our data base for the groups of companies classified as single-product, dominant-product, and related-product (unrelated-product companies were too few to analyze). Tests of significance were then performed on the differences between the groups' means. The results are shown in Table 8.5, with the variables listed in the order they are discussed in the text.

A preliminary question is whether the strategic-group classifications are correlated with the indexes of diversity that were introduced in Chapters 4 and 5. Although we do not expect the strategic classification to be completely collinear with any of these indexes, the closeness of the relation is a matter of some interest. The first six variables in Table 8.5 are the six diversity indexes that we calculated for these companies from Dun & Bradstreet data.[25] The same pattern holds for each index: diversity increases as we go from single-product to dominant-product to related-product; the differences between single-product and related-product and between dominant-product and related-product are statistically significant, but the difference between single-product and dominant-product never is. We expect output diversity to increase with the total size of a company and with its number of plants (see Chapter 4). The strategic groups differ significantly in total assets (TOTA), but the dominant-product firms are the largest. Despite this, the related-product group has more plants (NP) on the average. This pattern suggests that related-product companies typically achieved this status by acquiring smaller companies.

We can describe a few other features of these companies' balance sheets and income statements. The dominant group has the highest ratio of net to gross book value (NGA), suggesting that dominant-product firms' capital is either newer or more long-lived than the others'. They also have the highest ratio of non-current assets to sales (FFS), cash flow to sales (CFS), and capital expenditure to sales (KXS). Although these differences are weak in statistical significance, it appears that dominant-product firms are typically large-scale and capital-intensive. Rumelt has reported an affinity of U.S. dominant-product firms for vertical integration[26] that probably holds in Canada as well.

The strategic groups differ substantially in the market structures of their base industries. The dominant-product companies on the average are based in the most concentrated industries, according to both the four-firm (C468) and Herfindahl (HFL) measures of concentration. The size inequality among the leading companies of their industries (CVC) is also greater for the dominant-product group. These results are consistent with the large absolute size of dominant-product companies, with the large absolute size of their establishments (VPE), and with the fact that there is less diversification into their base industries by going firms from other industries (OWN--see Chapter 5). However, the single-product group's industries show larger

Table 8.5

Means, standard deviations, and significance of difference in means between large companies classified by corporate strategies*

Variable	Single product (9)		Dominant product (24)		Related product (23)		Significance of differences		
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Single, dominant	Dominant, related	Single, related
NS	5.446	2.30	6.875	5.016	11.3	5.67		5	5
DE3	.794	.168	.739	.187	.500	.201		5	5
DE4	.661	.219	.702	.176	.433	.183		5	5
DH	.459	.256	.437	.211	.700	.158		5	5
DW	.341	.292	.415	.276	.769	.346		5	5
DC	.969	.623	1.062	.537	1.700	.461		5	5
TOTA	140.5	144.6	440.9	507.2	217.2	213.1	5	5	
NP	8.222	4.63	8.667	6.472	12.4	6.95		5	5
NGA	.490	.080	.516	.102	.467	.078		5	
FFS	.532	.465	.620	.344	.480	.330		10	
CFS	.095	.047	.158	.050	.088	.050			
KXS	.051	.027	.084	.048	.065	.044	5		
C468	60.5	29.3	71.4	22.0	49.2	19.5			
HFL	.148	.112	.198	.099	.108	.097		5	
CVC	.762	.325	.945	.331	.751	.396		5	
VPE	3376	3006	7512	8534	3805	3390			

Table 8.5 (continued)

Variable	Single Product		Dominant Product		Related product				
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Single, dominant	Dominant, related	Single related
OWN	18.9	21.2	10.7	14.8	16.2	14.0	10		
MESU	4.107	4.50	3.02	3.01	2.038	1.198			5
ADI	1.38	1.94	1.30	1.75	.496	.473		5	10
NPW	.365	.160	.286	.099	.268	.101	5		5
WPW	2.78	.416	3.12	.559	2.97	.345	5		
WNP	6.78	.974	7.57	0.957	7.34	.662	5		10
EXP	0.100	.156	.168	.237	.306	.289		5	5
IMP	.072	.086	.230	.318	.328	.432			5
EFT	11.4	22.4	18.6	13.0	21.3	12.5			5
GRS	.137	.076	.103	.036	.085	.037	5	10	5
GSI	.062	.021	.069	.007	.079	.024			10
WGSI	.063	.018	.071	.031	.081	.018		10	10
CVPE	1.15	.889	.866	.472	.697	.813			10
PEQR	.123	.035	.101	.038	.088	.045	10		5
MBV	1.786	1.082	1.558	.990	1.291	.948			10
PAS	.109	.027	.085	.023	.085	.035	5		5
LEV	.403	.135	.321	.246	.318	.157			
ALNG	.063	.005	.064	.010	.074	.031			
SDS	.027	.032	.016	.018	.015	.015	10		5

Table 8.5 (continued)

Variable	Single Product		Dominant Product		Related Product				
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Single, dominant	Dominant, related	Single related
SMAC	.179	.106	.150	.047	.131	.037	5		
ADCG	.144	.074	.111	.053	.118	.083			
VDCG	.063	.049	.057	.040	.098	.092		5	10
ROI	.118	.072	.104	.049	.070	.046		5	5
WROI	.124	.068	.104	.047	.078	.027		5	5
DHI	.460	.215	.447	.150	.567	.153		5	10
SPL	13.5	13.1	14.9	9.12	27.5	15.9		5	5

*The classification of corporate strategies on which this analysis is based was generously supplied by Prof. Leonard Wrigley (University of Western Ontario). Numbers of companies in each category are shown in the headings. Figures indicate whether differences between group means were significant at the 5 or 10 percent level of confidence (1 percent significance was not calculated).

minimum efficient scales of production (based on data for the U.S. counterpart industries, MESU). The related-product companies do the least advertising in relation to sales (ADI) and also employ the smallest proportion of nonproduction workers (NPW), suggesting that their activities lie principally in producer goods. The single-product companies appear to require the fewest labor skills, and the dominant-product firms the most, on the basis of the wages they pay to both production (WPW) and nonproduction (WNP) workers.

The groups differ substantially in their exposure to the international economy. The base industries of the related-product group export the largest shares of their output (EXP) and face the most import competition (IMP), despite high tariff protection (EFT).

The differences among the groups in structural characteristics of their base industries remain very largely unchanged if we shift our focus to the employment-weighted average characteristics of all the manufacturing industries in which each company operates. The differences between the base and weighted-average industry characteristics of the individual groups do not differ importantly from the patterns described in Chapter 5.

We conclude that there is a good deal of systematic difference in the industrial environments of the strategic groups, and we must keep in mind the possibilities that strategic choices are largely determined by environmental conditions, and that differences in these groups' performance may result partly or largely from these differences in structural environment.

PERFORMANCE: COMPANY AND INDUSTRY

Let us turn to these differences in performance. It is commonly believed that differences in the growth rates of large corporations have recently been associated with diversification, and so we expect mean growth rates to descend from the related- to the dominant- to the single-product class. In fact the ranking by average compound annual growth rates (GRS) comes out the other way around, with all the differences at least weakly significant statistically. This reverse occurs despite the fact that the growth rates of industry shipments display the expected ranking for the industries in which these groups operate, whether we examine growth in the companies' base industries (GSI) or the weighted average of all their industries (WGSI). The data suggest the hypothesis that the single-product companies have been highly successful in their base activities and therefore felt no need to diversify, whereas the companies that diversified had the motive of improving a mediocre performance relative to their base industries. Another datum supporting this interpretation is that the growth in value added per establishment (CPVE) has been greatest for the single-product firms, implying that entry barriers may have deterred the "dilution" of their market growth by new entrants and facilitated the growth of competent going firms.

The profit performance of these groups (PEQR) is in accord with their growth performance, with single-product first, then dominant-product, then related-product (the difference between the last two is not significant). Despite the fad for go-go conglomerates, the stock market on average saw things the same way and accorded the single-product firms the highest ratio of market to book value (MBV). The single-product group also excels in profit

before interest on total assets (PAS). These conclusions can be related to features of the companies' capital structures. The groups do not differ significantly in leverage (LEV) or average interest paid on long-term debt (ALNG). The less diversified single-product companies did face greater variability of sales around their trend (SDS), a logical adjunct to their faster growth. The single-product firms (followed by the dominant) also experienced greater mean proportional absolute annual changes in their profits (SMAC). Despite this difference in profit variability, the total rate of return to equity shareholders (dividends plus capital gains--ADCG) did not differ between groups. Still, the market must have been more variable in its valuation of the related-product firms, because the standard deviation of the return on market value provided by their dividends and capital gains (VDCG) was greater than for the other groups, although the interannual variability of their profits on book value was less.

Do these differences in profit performance offer clear evidence on the effectiveness of strategic choices? To accept that conclusion, we must find that the companies' differences in profit performance diverge from those of their industries. However, the groups' differences in industry profit rates, using both the base industries (ROI) and the weighted average of industries (WROI), show the same pattern as the differences in the companies' own profits (PEQR): single-product highest, then dominant-product, then related-product. There are no significant differences in the ratios of mean company profits to industry profits. Furthermore, we note that the difference in the mean diversity of the company groups is exactly mirrored in the average diversity of all companies classified to their base industry (DHI, the Herfindahl index, is shown in Table 8.5, the others all exhibit the same pattern) and in a comprehensive measure of diversity based on census data, the proportion of value added by manufacture of companies classified to an industry accounted for by their plants classified to other industries (SPL).

We are inclined to draw the following conclusions about corporate strategies: (1) They are systematically related to a number of differences in the market structures of their base industries. (2) Over the period of the 1960's and early 1970's the conventional wisdom about the efficacy of these strategies--that related diversification by itself brings successful performance--is incorrect for large Canadian companies. (3) Differences in the profit performance of the strategic groups do not differ from the profit performance of the industries in which they operate, and the differences we find in the growth performance of companies and industries suggest that the causation runs from growth to strategy rather than the other way around. (5) Except for the qualification in the conclusion just preceding, none of our evidence is inconsistent with the hypothesis that strategic choice is largely determined by the structure of the company's principal market and has no net effect on market performance once this structure is taken into account.

NOTES TO CHAPTER 8

1. Statistics Canada (1973).

2. Although it subsumes the questions of the influence of international trade and restrictions on trade, and the demand-creating abilities of large-scale advertisers.

3. Our approach may be contrasted with the extensive literature that explores the statistical properties of the size distribution of firms. With a few notable exceptions (Mansfield (1962)), these studies examine firms divorced from the context of the competitive processes in their markets, or at best infer something about these processes by reasoning backward from a fitted distribution to a behavioral mechanism that is sufficient (though not necessary) to produce it. Because we view both seller concentration and diversity to be endogenous variables, we expect the sizes of firms to be explicable in terms of the structures of the product (and factor) markets in which they operate.

4. Information on plants belonging to companies in our sample comes from Dun & Bradstreet records. These exclude plants employing fewer than 50 workers or engaged primarily in non-manufacturing activities, and their completeness for other plants (though thought to be high) could not be tested.

5. One noncomparability between the Canadian and U.S. numbers is that the former include administrative establishments, the latter do not. Administrative establishments could be included for the United States only along with various other types of auxiliary establishments, and it seemed better to omit them all.

6. Rosenbluth (1957).

7. In interpreting these results, one should recall that Canadian plants of any given size have been found significantly more diversified in their outputs than U.S. plants of comparable size, Caves (1975). Therefore the smaller proportion of diversified plants belonging to Canadian multi-industry companies does not mean that the outputs of these companies are in any sense less diversified than the outputs of large American companies. Unfortunately this issue cannot be investigated directly with the data at hand.

8. The correlation shown in line 9 differs significantly from the one shown in line 3 at the 1 per cent confidence level, but from that shown in line 6 at only the 13 per cent confidence level.

9. The ideal control for the instability of sales in a firms' markets would be the standard deviation about its trend of a time-series of industry sales constructed using as a weight the company's activity in each market. The weighted-average standard deviation *(WSSI)*, of course, is not the same thing as the standard deviation of the weighted-average pattern of sales. Unfortunately, we have not been able to construct the more appropriate measure.

10. We stress one reason why the variable is less than an ideal control for the stability of the diversified company's environment. A weighted average of the variability indexes for its sales in different markets is not the same as a variability index for the weighted average of its sales. Our measure does not control for the fact that fluctuations over time of sales in different markets are imperfectly correlated, and some companies may succeed better than others in using this nonsynchronization to stabilize their own total sales.

11. The sign prediction is a bit suspect because it would go the other direction for an industry of competitive firms working at full capacity. If the demand curve faced by the firm is elastic, disturbances to it provoke less variation in the total value of the company's sales when the marginal-cost curve is steep (heavy fixed costs) than when it is flat (light fixed costs).

12. Alexander (1949).

13. This finding helps to explain the tendency to diversify into industries with less exposure to export markets, noted in Chapter 5.

14. See Wonnacott (1965); Part Two.

15. Our companies have been among the largest in Canada for the whole period under study. Company concentration could be stable or rising, even if size and growth were inversely related for this group, if companies that were initially smaller than those sampled grew faster during the period. See Prais (1958).

16. Orr, (1974).

17. <u>DNS</u> is less significant, probably because it tends to show higher diversity in large companies and therefore is correlated with <u>LTOTA</u>.

18. Chandler (1962).

19. Rumelt (1974).

20. Bower (1970).

21. Berry (1971); Rumelt, <u>op. cit</u>., Chap. 3.

22. Wrigley (1976). We are deeply indebted to Professor Wrigley for making his classification available to us.

23. The distribution of strategies for our 58 companies appears fairly typical for Wrigley's larger sample of 86, which in 1967 were distributed as follows: 16 single, 33 dominant, 34 related, and 3 unrelated. The bulk of the companies in Wrigley's sample but omitted from ours are not principally engaged in manufacturing.

24. Wrigley, op. cit.

25. Diversity is measured inversely by DE3 and DE4, positively by the others.

26. Rumelt, op. cit.

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PART FOUR

MARKET POWER AND THE COST OF CAPITAL

CHAPTER 9

INDUSTRIAL ORGANIZATION AND THE MARKET FOR CORPORATE FUNDS

JOHN T. SCOTT

Do large, diversified firms with market power enjoy advantages in capital markets, both in lower long-run average costs of capital and in favored access to funds when the Bank of Canada tightens monetary policy? If a firm's market power and other characteristics affect its ability to exchange long-term assets for funds, the market for corporate funds has an important power to shape the evolution of enterprise structure in a modern mixed economy. The objective of Part 4 is to provide theoretical analysis and empirical evidence on these questions for economists and policy-makers concerned with concentration of sellers within industries and the "super-concentration" associated with large conglomerate enterprises. After presenting the relevant theory, this chapter uses our sample of large corporations to test the hypothesis that firms with smaller size, less diversity, and less market power pay more for long-term funds. The statistical analysis is extended in the following chapter.

FIRMS' CHARACTERISTICS AND THEIR ABILITY TO ATTRACT FUNDS: A THEORETICAL ANALYSIS

We shall first explore the theoretical relationships between the required rate of return a firm must offer on its long-term securities and such structural characteristics as its market power and the riskiness of its environment. The analysis combines analytical tools and insights from the fields of corporate finance and industrial organization. From the former we draw upon the capital asset pricing model, but a major purpose of this section is to relax two of its assumptions and derive the implications of their abandonment for the behavior of capital markets. The assumptions to be relaxed are that transactions costs are either infinite or zero;[1] and that investors' subjective probability distributions of returns on long-term assets are either symmetrical or, if not, investors care only about the first two moments of those distributions.

The oldest and simplest view of markets for funds proposes that there is a "price of capital" determined by supply and demand in a perfect market. If the capital market is competitive, all borrowers pay the same price whether or not they are monopolists in their product markets. There is no room for an influence of market power. The capital asset pricing model (CAPM) provides a more sophisticated view, beginning with the idea that

diversification can reduce risk. Under strict assumptions the equilibrium rate of return, and hence price, for a capital asset can be derived. That price depends upon a certain form of risk. This section first identifies that risk and shows that its importance is lessened once transactions costs are incorporated into the model. The distinction between "systematic" and own-risk is drawn; the latter, deprecated by the CAPM, is seen to regain importance once transactions costs are recognized. Ultimately, of the many possibly relevant dimensions of a firm's market environment, diversification and market power emerge as theoretically and empirically relevant determinants of a firm's cost of capital. Both characteristics may influence a firm's own-risk by altering both the variance and skewness of the distribution of the firm's rate of return.

THE TRADITIONAL CAPITAL ASSET PRICING MODEL

We shall begin with insights from the theory of capital asset pricing and, by relaxing its assumptions, reach hypotheses about the relationships between firms' characteristics and their costs of funds. We assume that all investors have the same subjective perception of the longer-term assets which firms offer to investors in return for funds. Investors perceive the returns on those assets to be random variables distributed with mean, μ_i, and variance, σ_i^2. By storing their wealth in various combinations of these risky assets, investors could expect to realize various combinations of return (μ_p) and risk (σ_p) on their portfolio. Diversification is assumed to be costless, that is there are no transactions costs. The segment AB is the relevant part of the opportunity set depicted in Figure 9:1a.[2] Assume that one asset is risk-free, having a return of μ_0 and risk of $\sigma_0 = 0$, and can be borrowed in unlimited amounts at the rate of μ_0. Investors can vary the proportions of their wealth in the risk-free asset and in "the" efficient portfolio of risky assets (Z) having expected return, μ_m, and risk, σ_m, and obtain any combination of risk and expected return on the line segment through μ_0 and Z. Z denotes "the" market portfolio of risky assets, because in equilibrium all assets must be included in "the" market portfolio. Figure 9.1b depicts the case of several efficient portfolios of risky assets.[3] Note that all efficient portfolios of risky assets are perfectly correlated. If they were not, combinations of the portfolios would provide risk-return possibilities dominating those obtained by any of the portfolios individually. Those individual portfolios could therefore not have been efficient.

If we assume that the investors maximize expected utility and that utility depends only on percentage changes in wealth, then utility is a function of the net rate of return on the portfolio. Given the additional and rather arbitrary assumption that either the utility function is quadratic in the net rate of return on the portfolio or all assets are joint normally distributed,[4] expected utility depends only on μ_p and σ_p^2.

Then the investor's indifference curves and equilibrium portfolio can be depicted as in Figure 9.1c. $\underline{E}$ is the equilibrium for the investor with the indifference curves pictured. At $\underline{E}$, the investor has chosen the point on the efficient frontier such that the rate at which he is willing to exchange risk for return equals the rate at which he can exchange them in the market for funds.

The model determines a market price of a unit of expected returns in terms of risk. By altering the proportions of the market portfolio and the risk-free asset in his personal portfolio, the investor can purchase any combination of risk and expected return along the line through μ_0 and $\underline{Z}$. Each additional unit of expected return above the risk-free rate costs the investor $\sigma_m/(\mu_m - \mu_0)$ units of risk.

What does this model imply about the required rate of return that firms must offer on their long-term securities, and thereby about the cost of funds for differently situated firms? The required rate of return on any long-term asset is the risk-free rate plus $(\mu_m - \mu_0)/\sigma_m$ units of expected return for every unit of risk that the asset will impose upon its buyers. If a higher or lower coupon rate were offered, assuming that capital markets worked well, the price of the asset would rise or fall respectively until each unit of relevant risk that the asset imposed did in fact cost the firm that required rate.

What is that relevant risk of a risky asset? The capital asset pricing model identifies that relevant risk as the addition to the investor's total risk exposure (risk on the investor's efficient portfolio of the riskless asset and "the" market portfolio of risky assets) resulting from his incremental investment in the particular asset. If h_i is the fraction of the investor's portfolio invested in equilibrium in the $\underline{i}$th asset, the return on which is a random variable $\tilde{r}_i$ with expected return μ_i; and if the investor's efficient portfolio has return $\tilde{r}_p$ with expected return μ_p and standard deviation $(\tilde{r}_p) = \sigma_p$, defined as risk; and if "the" efficient market portfolio has return $\tilde{r}_m$ and risk $\sigma(\tilde{r}_m) = \sigma_m$; then as Jensen has shown,[5] the relevant risk of the $\underline{i}$th asset is

$$\frac{\partial \sigma_p}{\partial h_i} = \frac{\text{cov}(\tilde{r}_i, \tilde{r}_m)}{\sigma_m} .$$

Similarly, we can conceptualize the relevant risk of the $\underline{i}$th asset as its marginal contribution to the total risk inherent in the market portfolio. If x_i is the weight received by asset $\underline{i}$ in the market portfolio, then[6]

$$\frac{\partial \sigma_m}{\partial x_i} = \frac{\text{cov}(\tilde{r}_i, \tilde{r}_m)}{\sigma_m} .$$

Thus, the required rate of return, μ_i, for the ith risky asset equals the risk-free rate plus $(\mu_m - \mu_0)/\sigma_m$ units of expected return for every unit of relevant risk that the asset will impose upon its buyers or society. Algebraically,

$$\mu_i = \mu_o + \left(\frac{\mu_m - \mu_o}{\sigma_m}\right)\left(\frac{\text{cov}(\tilde{r}_i, \tilde{r}_m)}{\sigma_m}\right)$$
$$= \mu_o + (\mu_m - \mu_o)\,\frac{\text{cov}(\tilde{r}_i, \tilde{r}_m)}{\sigma_m^2}$$
$$= \mu_o + (\mu_m - \mu_o)\rho_{im}\,\frac{\sigma_i}{\sigma_m} \;=\; \mu_o + (\mu_m - \mu_o)\beta$$

where investors' perceptions of β (the systematic risk, that explained by the covariance with the market) have often been estimated by the regression coefficient from a regression of the ith asset's returns on the returns of the market portfolio, that is by the covariance of the historical series of the asset's and the market portfolio's returns divided by the variance in the historical series of the returns on the market portfolio.[7] An asset's required rate of return is greater the higher the correlation of its returns with the return on the market portfolio and the larger the ratio of the standard deviation of its returns to the standard deviation of the return on the market portfolio. If the actual return on the ith risky asset is greater than μ_i above, there will be an excess demand for the asset. If the actual return is less than μ_i, there will be an excess supply. In equilibrium, the relationship

$$\mu_i = \mu_o + \begin{array}{c}\text{(market price}\\ \text{of risk)}\end{array} \begin{array}{c}\text{(relevant risk of}\\ \text{the } i\text{th asset)}\end{array}$$

will hold.

ASSET PRICING WITH FINITE TRANSACTIONS COSTS

By transactions costs, we mean all of the costs, tangible (such as explicit costs of searching for information or brokerage fees) and intangible (psychological and physical, such as the bother of information search). Finite transactions costs imply that investors actually face an opportunity set over means and standard deviations that is different from the opportunity set of the traditional capital asset pricing model. The model traditionally assumes that there are no costs associated with constructing a well-diversified portfolio when in fact such costs clearly exist. Once we admit transactions costs, owning the stock of two or three well-diversified companies may be preferable to diversifying one's portfolio into all stocks offered, if the companies themselves can diversify at proportionally lower transactions costs than can the investor. Equally clearly, if efficient portfolios of just a

few stocks are the rule rather than the exception, then we expect the own-variance (nonsystematic risk) of the individual risky asset to be important for determining its price, because the variance of each asset comprises a larger percentage of the variance of the efficient portfolio.

For expository purposes, a very simple model shows how transaction costs affect the traditional capital asset pricing model. Assume that an investor has $100 to invest in a portfolio and that all of the assumptions of the traditional model[8] hold with the exception that there are transactions costs of one dollar associated with the purchase of each risky asset. Figure 9.2a shows the mapping that transforms the traditional opportunity set depicted in Figure 9.1a into the actual opportunity set faced by the investor. We assume that transactions costs are not stochastic, and σ_p remains the same for each portfolio since σ_p consists of terms

$$X - E(X) = X - t - E(X - t)$$

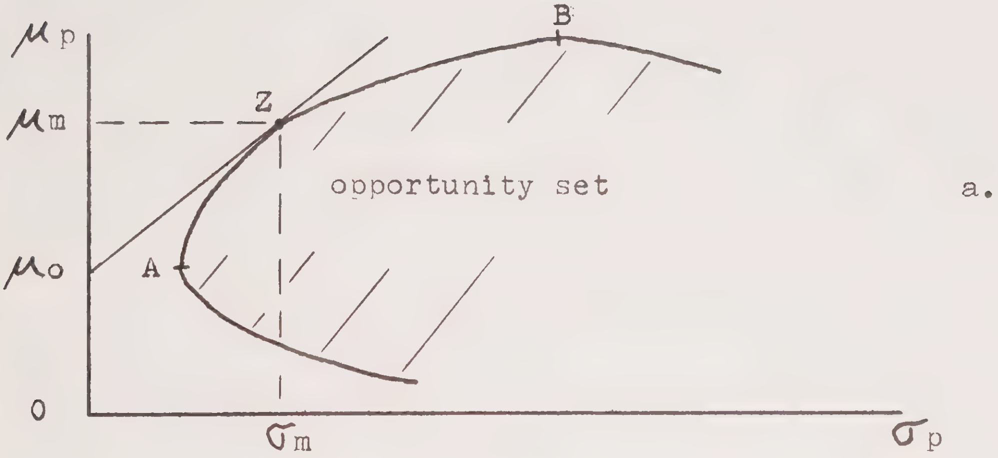
where E is the expected value operator, X represents an asset's rate of return (which is a random variable), and t is the nonstochastic transactions cost associated with the asset. z equals the number of assets in the market portfolio (Z), and the portfolio denoted by C includes 1/10 z assets.

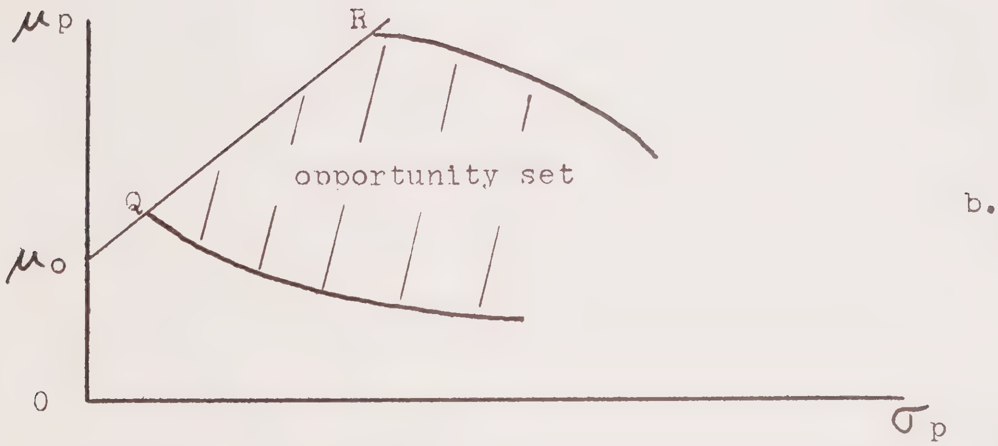
Because of the transactions costs, "the" market portfolio is no longer efficient for the investors with the opportunity set pictured. The effective capital market line showing the rate at which these investors can exchange risk for return is depicted in Figure 9.2b under the assumption that there is no transactions cost for holding the riskless asset. In the traditional CAPM, all efficient portfolios had to be perfectly correlated, because otherwise they would be dominated by combinations of themselves and hence could not be efficient. But with transactions costs the bulge in the traditional opportunity set (a bulge resulting from efficient combinations of different portfolios) above the effective capital market line is no longer relevant, having been erased by the transactions costs of putting portfolios together. With transactions costly, investors may have several efficient portfolios that are not perfectly correlated from which to choose. And the market portfolio may not be a relevant option.

With this conceptual framework, we can explore different types of transactions costs for different types of investors, verify the validity of the assertions at the beginning of the paper, and provide a formal statement of why finite transactions costs provide a direct link between firms' characteristics and advantages in the markets for corporate funds.

We expect different classes of investors to face different opportunity sets because transactions costs affect their anticipated rates of return differently. For example, if we posit, as above, a fixed $1 transactions cost for every asset in an investor's portfolio, the distortion from the traditional opportunity set which for an investor with $100 invested was t ($\mu_{effective} = \mu - t$ where t was the number of assets in any particular

Fig. 9.1 The Traditional Model





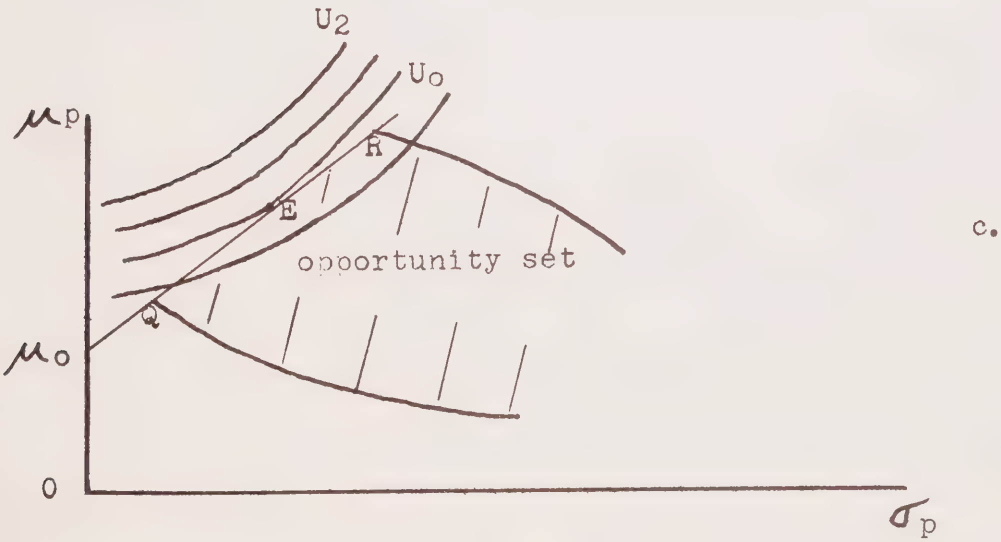
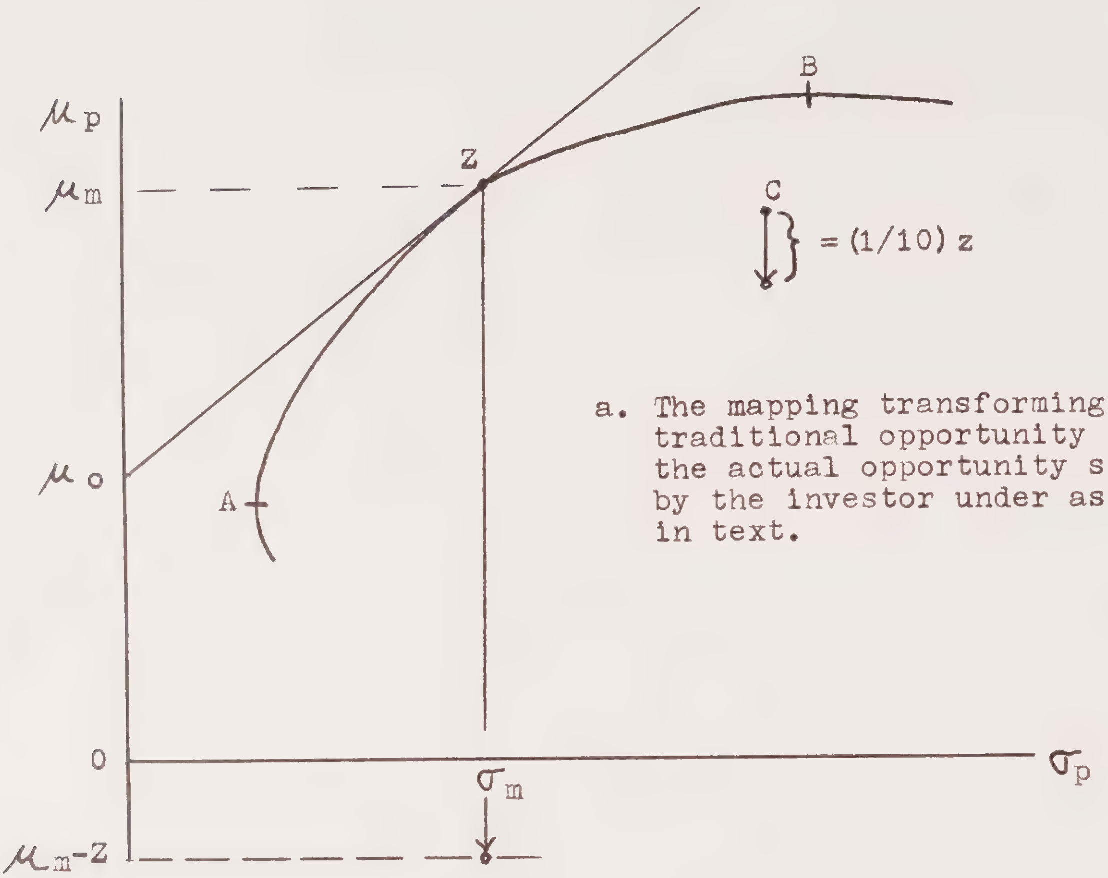
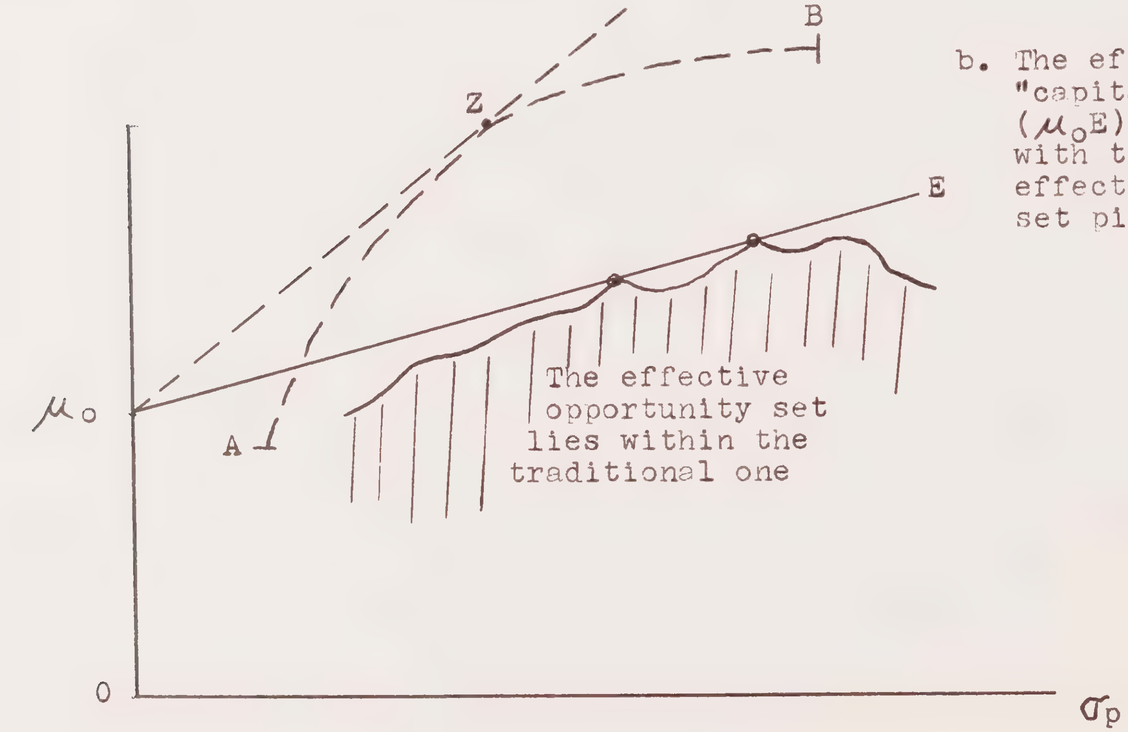


Fig. 9.2 The Opportunity Set with Transactions Costs



a. The mapping transforming the traditional opportunity set into the actual opportunity set faced by the investor under assumptions in text.



b. The effective "capital-market line" (μ_oE) for investors with the particular effective opportunity set pictured.

portfolio) becomes t/10 for an investor with one thousand dollars invested and t/10,000 for an investor with one million dollars invested. Thus, the existence of fixed absolute transactions costs based on the number of assets in one's portfolio makes the opportunity set faced by an individual, albeit wealthy, investor dealing through his local stockbroker quite different from the opportunity set faced by an insurance company. The relative importance of such diverse classes of investors in the aggregate demand for longer-term assets is then an important determinant of the final array of equilibrium asset prices.

To the extent that transactions costs vary with the value of the transaction (because, for example, of commissions expressed as a percentage of sales), the advantage of large-volume investors who must pay commissions on stock purchases would be blunted. However, the large investor presumably incurs overhead costs of establishing a team of analysts and transactors and informing himself about individual assets, and hence will realize economies of scale and incur some distortion of the traditional opportunity set due to transactions costs.

In general, different classes of investors face different types of transactions costs. Those costs determine the actual opportunity set over means and standard deviations, and the capital market equilibrium will depend on the relative strengths of the demands of the different classes of investors. Clearly there can be both fixed and variable costs of changing portfolios, and the level of either class of cost and the mix of types of cost could vary with investors. As long as investors face some of either kind of cost, the basic modification of the capital asset pricing model is important. If all the costs were fixed costs of informing or transacting, then the transactions costs would converge on zero as the size of the investor grew. On the other hand, if all the costs were variable, the transactions costs would not converge on zero, but rather on the variable cost.

Fixed transactions costs create opportunities for intermediation, and the relative importance of fixed and variable costs for an economy should determine the type of intermediation therein. If transactions costs were mostly fixed and all investors of the same size, we should observe investors pooling their funds until there was but one huge mutual fund in the economy. For one transaction--buying into the fund--the investor would reap the benefit of spreading the fixed costs of investing in the market portfolio over all the investable funds in the economy. If transactions costs were mostly fixed and investors differed in size, large investors might not be willing to accommodate the small ones; managers of funds would note that attracting a large investor advantaged the fund's members more than a small one, and differential fixed charges for entering the fund would emerge. If transactions costs were mostly variable, regardless of the uniformity of investors' sizes, there would be little advantage in pooling funds before selecting stocks. Only if transactions costs were mostly fixed and all investors of the same size should we expect transactions costs to converge on zero and the traditional opportunity set of the capital asset pricing

model to be relevant. The fact that we do not observe one huge fund in our economy suggests that diversity in investors' sizes and a significant amount of variable costs in the investment process exist, thus rendering the unmodified capital asset pricing model empirically empty.

Note that in the traditional CAPM with no transactions costs, there is no incentive for firms that issue securities to diversify. Yet if the company faces no transactions costs for diversification into certain types of assets while investors in general face costs if they diversify, we expect to find diversified companies. It would be more efficient for company one to buy company two, rather than for the investors in company one to buy stock in company two. The appropriate diversification of firms can be efficient even if it entails no higher real return on their combined resources. In general, transactions costs imply that the assets of diversified firms will command a premium in the markets for funds because, by diversifying, the firm has provided a service that would have been costly for the investor to accomplish. That diversification might have been more costly for the investor than for the firm seems empirically reasonable.

Note from Figure 9.2's new effective "capital-market line" that the market price of risk is $\frac{\mu_{ei} - \mu_o}{\sigma_{ei}}$ where u_{ei} and σ_{ei} are the subjectively evaluated expected effective return and standard deviation of the ith efficient portfolio of risky assets, and where there is no transactions cost for holding the riskless asset. This market price of risk is equal for all i. Within any efficient portfolio (combining the riskless asset with one of the efficient portfolios of risky assets), the same economic logic applies that determined the equilibrium prices for capital assets in the traditional CAPM. The required rate of return on an individual asset is in equilibrium

$$\mu_j = \mu_o + \frac{\mu_{ei} - \mu_o}{\sigma_{ei}} \cdot \frac{\mathrm{cov}(\tilde{r}_j, \tilde{r}_{ei})}{\sigma_{ei}},$$

where ei refers to the ith particular efficient portfolio of which the jth asset is a part. For all i, that is, for all efficient portfolios of which the jth asset is a part, the equation must hold. It follows immediately that the effect of the variance of each individual asset on its own required rate of return is no longer on the order of $1/n$ where n is the number of risky assets in the market, but rather on the order of a weighted average of one divided by the number of risky assets for each of the efficient portfolios in which it appears, with the $(1/n_i)$'s being weighted by the dollar volume of the investments in the jth asset by investors in each particular portfolio. It also follows that the traditional β coefficient is in general not the sole or even the most important determinant of the equilibrium price of a risky asset if investors for whom transactions costs are important bulk large enough in aggregate to have an appreciable impact on

the equilibrium outcome. Indeed the empirical work of Lintner and Douglas[9] supports the theoretically derived expectation that β coefficients should be less important than own-variance as a determinant of the required rate of return on capital assets. The empirical research in this chapter also supports the hypothesis that transactions costs bulk large enough to imply that nonsystematic risk is an important determinant of capital assets' prices.

ASSET PRICING AND INVESTORS' SUBJECTIVE EVALUATIONS

Analysts have traditionally, and reasonably, assumed that investors care about characteristics of assets other than subjectively evaluated means and variances of returns. The skewness of investors' subjectively evaluated distribution of returns should be important.[10] For a highly leveraged firm, for example, investors in the firm's equity might reasonably attach greater probability to very low returns, other things being equal. This is because the probability of bankruptcy is greater, and therefore, because bankruptcy is not costless, there is a greater probability that equity-holders will suffer loss. Or perhaps smaller firms will not be able to absorb as easily various unpredictable shocks (say, a squabble among managers at plant B), and hence investors' subjectively evaluated distribution of the returns on a firm's assets may again be skewed. Or perhaps undiversified firms, with "all their eggs in one basket" may be considered more likely to exit; and hence again we expect skewness as depicted in Figure 9.3.

MONOPOLY POWER AND THE MARKET FOR CORPORATE FUNDS

This study asks whether firms enjoy an advantage in the market for corporate funds due not only to their size and diversity but also to their monopoly power. What are our expectations about the effect of monopoly power on the required rate of return both in steady-state conditions free of monetary disturbances and in the short run with variable conditions in the markets for funds?

The fact that a firm earns monopoly profits on its real assets itself implies nothing about the return on the market value of its equity shares. Nonetheless, we might reasonably expect that the required rate of return on long-term assets offered for funds would be less for firms with monopoly power than for firms in perfectly competitive industries, things other than monopoly power being equal. The expected rate of return on investment for firms with monopoly power, other things being equal, would be greater; and hence, the coefficient of variation, σ/u, would be less for any given σ. Traditionally, investors have been assumed to be concerned with the relative dispersion of the net operating income of the firm, and the coefficient of variation reflects that relative dispersion.[11]

Further, a reduction in market demand or increase in costs that would not cause a monopolist to exit would imply a finite probability of exit for

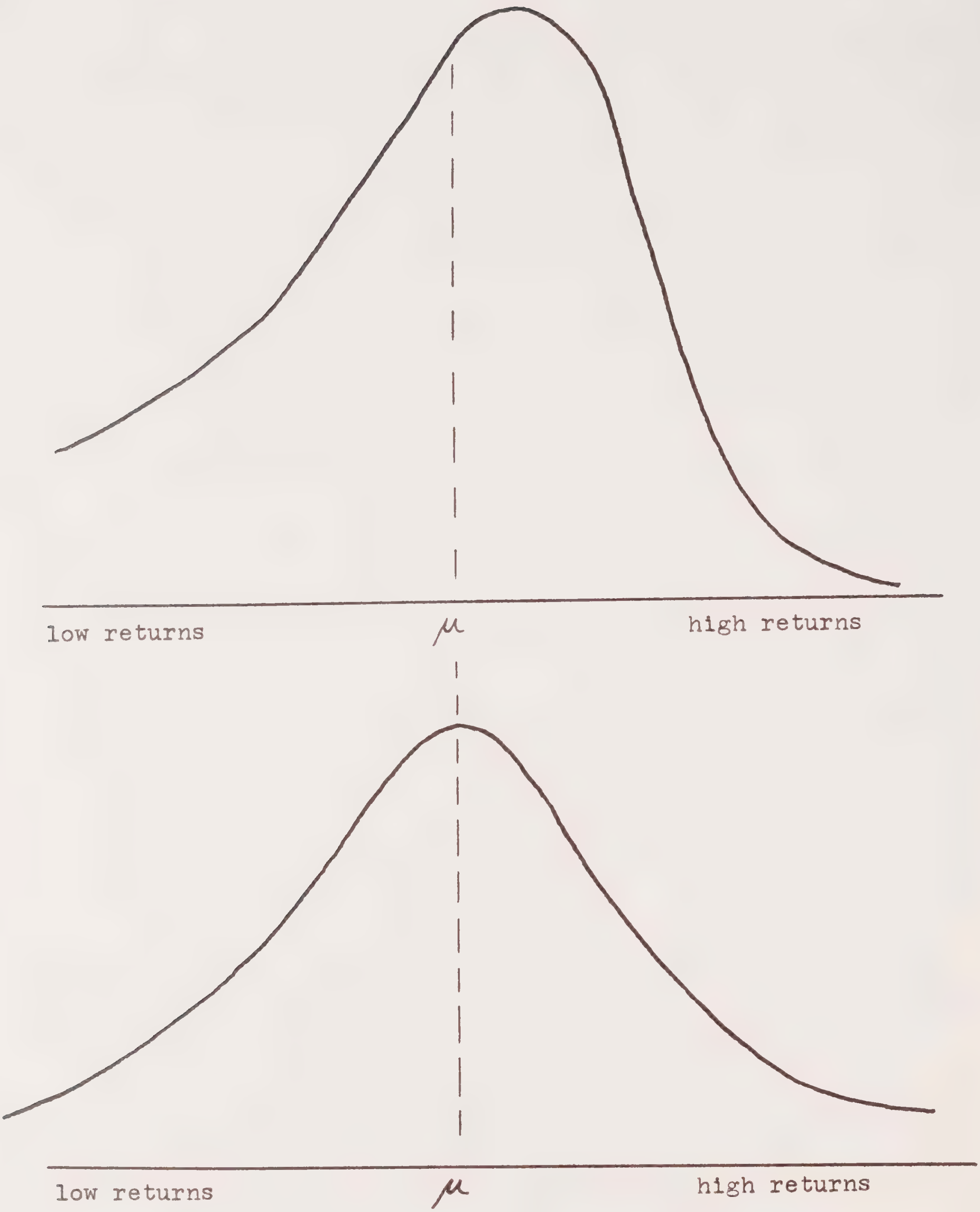


Fig. 9.3 For small firms, undiversified firms, firms without market power, or firms with high debt to equity ratios, investors may form subjective probability distributions of returns which are skewed.

one firm in a competitive industry. Also, an increase in demand or decrease in costs that would imply additional long-run profits for a monopoly (assuming entry barriers) would imply only short-run profits for firms in a competitive industry. Because firms exit from competitive industries following profit-reducing shocks and enter them after profit-increasing shocks, we expect investors' subjective evaluations of the probability distributions of returns for firms in competitive industries to be skewed, with more of the probability over very low returns (see Figure 9.3).

The foregoing arguments are valid even with "uniform" credit market conditions, where by uniform we mean an unchanging equilibrium in the markets for funds with constant rates and flows. With credit-market conditions variable, all of the profit-shock considerations become more important, because monetary phenomena can create changes in demand and cost conditions of various markets. Furthermore, once we realistically assume periodic easing and tightening of credit markets, we expect that small, undiversified firms without market power are the prime candidates for the "fringe of unsatisfied borrowers" that grows during a tightening of credit markets. Since the marginal costs of a bank's lending of a dollar to a firm in the "fringe" include the present discounted value of earnings lost with the "steady" (large, diversified firm with market power) customer who went elsewhere when denied the dollar, those marginal costs become quite high when funds are scarce. We might expect that small, undiversified firms without market power are among the first to be priced out of the markets for funds during a credit crunch.[12] The very fact that a firm is having trouble borrowing from a bank will imply that other sources of funds will be more wary of purchasing the firm's offerings.

THE DATA, EMPIRICAL SPECIFICATIONS AND RESULTS

We now present empirical evidence lending good support to the hypothesis that diversified firms with market power possess an advantage in the markets for corporate funds. The regressions presented control for own-variance (which may be influenced by market power and diversification) and then include market power, diversification, and size to capture the "skewness" effects.

Profits on physical assets should vary directly with barriers to the mobility of new firms into the firm's industry or strategic-industry sub-group.[13] Yet reasonably well-functioning capital markets would imply that equity owners' earnings relative to the market value of their equity would be equalized across firms even when monopoly power implies greater expected streams of earnings, other things such as "risk" (monopoly power can affect that too, as explained above) being equal. The streams of quasi-rents resulting from any monopoly power are capitalized in the market value of the firm, and those not fortunate enough to be original owners and realize the capitalization of the quasi-rents simply earn a normal rate of

return. But the presence of monopoly power may lower the required rate of return on equity because it alters perceptions of risk as explained above. Similarly, our analysis suggests that the rate of return that the firm must offer to secure longer-term funds will vary directly with non-systematic risk and financial risk, yet vary inversely with size and diversification, even apart from any effect of size and diversification on perceptions of risk. Size and diversification should be associated with lower own-variance unless oligopolistic interdependence itself is a significant source of disturbances. But apart from the effect on perceptions of own-variance, these variables may influence perceptions of the skewness of the firm's distribution of returns. Thus, even with own-variance controlled we expect size, diversification, and market power to vary inversely with the required rate of return on long-term assets.

The following variables are for the sample of 125 Canadian firms described in Appendix A. Because some firms did not report some variables, the number of observations used in the regressions vary.

DEPENDENT VARIABLES

To measure the rate of return that the firm must pay to secure longer-term funds, this study uses the following two variables.

ADCG Average from 1962 to 1974 of the actual yearly return to common-equity holders of the firm. ADCG is the average of the yearly observations: (dividends plus capital gains on common equity) / (market value of common equity) = DCG.

APCR Similar to ADCG but uses net income available for common-equity holders rather than dividends. Perhaps equity holders use available net income rather than dividends to evaluate long-run prospects for the firm. (Net income available for common-equity holders is net income minus taxes currently payable minus preferred dividend requirements.) APCR is the average of the yearly observations: (net income available for common-equity holders plus capital gains on common equity) / (market value of common equity) = PCR.

INDEPENDENT VARIABLES

To test the importance of the characteristics of firms for their required rates of return, the following variables are used to measure those characteristics hypothesized to be important for investors' subjectively evaluated distributions of returns.

Nonsystematic Risk.

To measure each firm's nonsystematic risk, we use both the historical variance in returns and the historical variance of returns around the trend in industrial production, as well as measures of the firm's traits, such as size, diversification, market power, and financial risk, that may also affect investors' evaluations of the firm's longer-term assets.

VDCG Variance of the yearly observations used to construct the variable ADCG.

VPCR Variance of the yearly observations used to construct the variable APCR.

DRESG Variance of the residuals from the ordinary-least-squares regression $DCG_t = a + bINDP_t$ where $t = 1962, 1963, \ldots 1974$ and INDP is the index of industrial production described in the appendix.

PRESR Variance of the residuals from the ordinary-least-squares regression $PCR_t = a + bINDP_t$ where $t = 1962, 1963, \ldots 1974$.

Market Power.

To measure market power, we use the conventional concentration ratios.

C468 Four-firm concentration ratio for the firm's primary industry in 1968.

C868 Eight-firm concentration ratio for the firm's primary industry in 1968.

Size.

To measure each firm's size, we employ both total assets and the number of manufacturing plants.

TOTA Total assets of the firm, averaged over 1961-1974.

NP Number of plants engaged in manufacturing controlled by the firm.

Diversification.

To measure each firm's diversification, three measures are used, DW, DH, and DC. They are defined in Chapter 4.

Financial Risk.

To measure each firm's financial risk, the ratio of debt to equity was used.

LEV Average ratio of debt to equity, 1961-1974 ("leverage").

Systematic Risk.

To measure each firm's systematic risk we employ the covariance of the firm's rate of return with the index of industrial production for Canada divided by the variance of that index. The measure is thus analogous to the "beta coefficient" of the capital asset pricing model. However, since the index of industrial production increased continuously from 1962 to 1974, a high beta in this case might be considered a desirable characteristic which lowers the required rate of return.

BETAG Ordinary least squares estimate of b from the regression used to derive DRESG.

BETAR Ordinary least squares estimate of b from the regression used to derive PRESR.

Tables 9.1 and 9.2 present the regressions testing these hypotheses, and Table 9.3 contains the simple correlation coefficients. The hypothesized relationships between a firm's characteristics and its required rate of return on long-term assets evidently hold for this sample. The signs of the coefficients of the variables in the tables remain the same, and their t-statistics about the same, when TOTA or NP is added to each specification as a measure of size. But although TOTA and NP always have the hypothesized negative sign, the t-statistics for their coefficients are always less than one.

The estimated impact of seller concentration in the primary industry is fairly substantial, and significant when measured by C868 in the equations explaining APCR. Concentration is measured in percentage form (that is, on a scale from zero to one hundred), while the dependent variables are measured as fractional rates of return (for example, 0.06 is a return of 6 per cent). An increase in concentration of 10 points (for example, from 40 to 50) results in an estimated decrease in the required rate of return of between 0.004 and 0.01 or between 0.4 per cent and 1 per cent.

Table 9.4 reveals the equations presented in Tables 9.1 and 9.2 but with alternative measures of market power.

WC468 Weighted average 4-firm concentration ratio for the industries in which the firm operates.

WC868 Weighted average 8-firm concentration ratio for the industries in which the firm operates.

Table 9.1

Regression analysis of determinants of return on market value of equity (dividends plus capital gains--ADCG)*

Eq. no.	Constant	VDCG	DRESG	C468	C868	DW	DH	DC	LEV	BETAG	Corrected R^2	Degrees of Freedom
1.	.14 (4.6)		.11 (7.3)	-.00040 (-.94)		-.045 (-1.6)			.039 (2.2)	-4.6 (-6.1)	.45	108
2.	.15 (4.3)		.11 (7.4)		-.00054 (-1.3)	-.046 (-1.7)			.039 (2.2)	-4.5 (-6.1)	.46	108
3.	.14 (4.4)	.11 (7.6)		-.00046 (-1.0)		-.043 (-1.4)			.050 (2.7)		.38	109
4.	.16 (4.2)	.11 (7.7)			-.00059 (-1.3)	-.044 (-1.5)			.051 (2.7)		.38	109
5.	.15 (4.1)		.11 (7.5)	-.00043 (-1.0)			-.054 (-1.3)		.036 (2.0)	-4.5 (-6.0)	.45	108
6.	.16 (4.0)		.11 (7.6)		-.00057 (-1.3)		-.058 (-1.4)		.036 (2.0)	-4.5 (-6.0)	.45	108
7.	.16 (4.3)	.11 (7.9)		-.00051 (-1.1)			-.070 (-1.6)		.047 (2.5)		.38	109
8.	.18 (4.2)	.11 (7.9)			-.00066 (-1.4)		-.073 (-1.7)		.047 (2.5)		.39	109
9.	.14 (4.2)		.11 (7.4)	-.00041 (-.96)				-.022 (-1.4)	.037 (2.1)	-4.5 (-6.0)	.45	108
10.	.16 (4.1)		.11 (7.4)		-.00055 (-1.3)			-.023 (-1.5)	.037 (2.1)	-4.5 (-6.0)	.45	108
11.	.15 (4.2)	.11 (7.7)		-.00048 (-1.0)				-.023 (-1.4)	.049 (2.6)		.38	109
12.	.17 (4.1)	.11 (7.7)			-.00061 (-1.3)			-.024 (-1.5)	.049 (2.6)		.38	109

*t-statistics in parentheses below the coefficients

Table 9.2

Regression analysis of determinants of return on market value of equity capital (earnings plus capital gains--APCR)*

Eq. no.	Constant	VPCR	PRESR	C468	C868	DW	DH	DC	LEV	BETAR	Corrected R^2	Degrees of freedom
1.	.21 (5.7)		.087 (6.7)	-.0068 (-1.3)		-.031 (-.91)			.025 (1.1)	-4.9 (-5.9)	.41	108
2.	.24 (5.5)		.087 (6.7)		-.00093 (-1.8)	-.034 (-.99)			.025 (1.2)	-4.9 (-5.9)	.41	108
3.	.22 (5.4)	.089 (6.8)		-.00075 (-1.3)		-.034 (-.92)			.040 (1.7)		.32	109
4.	.25 (5.3)	.090 (6.9)			-.00099 (-1.8)	-.037 (-1.0)			.040 (1.7)		.33	109
5.	.21 (4.8)		.088 (6.8)	-.00069 (-1.3)			-.030 (-.61)		.023 (1.0)	-4.9 (-5.8)	.40	108
6.	.24 (4.8)		.089 (6.9)		-.00095 (-1.8)		-.037 (-.74)		.023 (1.0)	-4.9 (-5.8)	.41	108
7.	.23 (4.9)	.091 (7.0)		-.00079 (-1.4)			-.055 (-1.0)		.037 (1.6)		.32	109
8.	.27 (4.9)	.091 (7.1)			-.0010 (-1.8)		-.062 (-1.2)		.037 (1.6)		.33	109
9.	.21 (5.1)		.087 (6.7)	-.00068 (-1.3)				-.014 (-.71)	.024 (1.1)	-4.9 (-5.8)	.40	108
10.	.24 (5.1)		.088 (6.8)		-.00094 (-1.8)			-.016 (-.81)	.024 (1.1)	-4.9 (-5.8)	.41	108
11.	.23 (5.0)	.090 (6.9)		-.00076 (-1.3)				-.018 (-.89)	.038 (1.6)		.32	109
12.	.26 (5.0)	.090 (6.9)			-.0010 (-1.8)			-.020 (-.99)	.039 (1.7)		.33	109

*t-statistics in parentheses below the coefficients

Table 9.3

Simple correlations for variables used in Tables 9.1 and 9.2.

	APCR	ADCG	VPCR	VDCG	PRESR	DRESG	C468	C868	DW	DH	DC	LEV	BETAR	BETAG
APCR	1.0													
ADCG	.97	1.0												
VPCR	.56	.58	1.0											
VDCG	.57	.59	.99	1.0										
PRESR	.46	.48	.98	.98	1.0									
DRESG	.47	.49	.98	.98	.99	1.0								
C468	-.13	-.11	-.060	-.061	-.026	-.026	1.0							
C868	-.15	-.11	-.036	-.038	.0042	.0028	.96	1.0						
DW	-.11	-.15	-.12	-.11	-.12	-.12	-.11	-.12	1.0					
DH	-.08	-.12	-.024	-.018	-.023	-.020	-.16	-.19	.79	1.0				
DC	-.11	-.14	-.099	-.093	-.10	-.10	-.13	-.15	.95	.93	1.0			
LEV	.15	.20	.039	.020	.028	.014	-.048	-.031	.091	-.034	.027	1.0		
BETAR	-.40	-.42	-.069	-.079	.10	.10	.069	.071	.0070	.087	.039	-.13	1.0	
BETAG	-.39	-.40	-.061	-.073	.10	.10	.078	.080	-.020	.062	.0099	-.12	.99	1.0

Table 9.4

Regression analysis of determinants of return on market value of equity (dividends plus capital gains--ADCG) using weighted average measures of concentration*

Intercept	Independent variables								Corrected	Degrees of
	VDCG	DRESG	WC468	WC868	DW	LEV	BETAG	R^2	R^2	Freedom
.14 (3.8)	.11 (7.4)		-2.0×10^{-4} (-.37)		-6.7×10^{-2} (-2.3)	5.4×10^{-2} (2.8)		.39	.37	113
.15 (3.5)	.11 (7.4)			-2.7×10^{-4} (-.51)	-6.8×10^{-2} (-2.3)	5.4×10^{-2} (2.8)		.39	.37	113
.13 (3.9)		.11 (6.9)	-1.3×10^{-4} (-.26)		-6.9×10^{-2} (-2.4)	4.3×10^{-2} (2.3)	-4.5 (-5.7)	.45	.43	112
.14 (3.4)		.11 (7.0)		-1.9×10^{-4} (-.37)	-7.0×10^{-2} (-2.5)	4.3×10^{-2} (2.3)	-4.5 (-5.7)	.45	.43	112

*The t-statistics are in parentheses below the coefficients.

Although the sign on these alternative measures remains negative as hypothesized, the result is not significant, perhaps because the estimated coefficients are smaller. Additionally, the simple correlations between the weighted concentration measures and the diversification measures are twice those between the primary-industry concentration measures and the diversification measures. For example, the simple correlation between DW and C468 is -.11 while for DW and WC468 it is -.20. Hence, perhaps multicollinearity is a factor. We might also expect that in evaluating a firm's market power, investors focus on the firm's primary industry; and hence, we get the stronger results in Tables 9.1 and 9.2. The signs and significance of the remaining variables are similar, except that diversification (DW) appears more significant. The coefficients for the equations using the alternative measures of diversification and for the equations explaining APCR show precisely the same pattern in terms of signs and significance as for the equations in Table 9.4.

NOTES TO CHAPTER 9

1. Jensen (1972), pp. 381-82.

2. Sharpe (1964)

3. Ibid., pp. 405-406.

4. Yellen (1973).

5. Jensen, op. cit., p. 362.

6. Ibid., p. 363.

7. The covariances calculated from historical time-series data may correspond very badly to the subjective covariances that affect investors. Suppose my portfolio consists of stock in a tin-can company, and I am thinking of diversifying into glass jars. If the short-run returns to the two industries are governed by fluctuations in demand for containers, the covariance will be positive and high. Yet the "real" risk could be shifts in relative input costs (glass or tin plate), and my subjective covariance associated with long-run *internal* rates of return could well be negative. Once we admit transaction costs, this argument is most cogent, because such costs may lock in the investor and make his decisions to buy or sell irreversible in the short-run.

8. Jensen, op. cit., pp. 358-59.

9. Ibid., p. 364.

10. Van Horne (1971), p. 26.

11. Ibid., p. 22. Of course there is the possibility that relatively oligopolistic markets experience higher returns but greater variance in returns because unstable tacit agreements occasionally break down (Caves and Yamey, (1971) pp. 513-17). Such instability could outweigh attempts by the oligopolists to lead the quiet life.

12. Note that this is not the traditional idea of rationing in a competitive market, but rather the notion of different classes of borrowers for whom the lenders face different marginal cost curves. Observers might think they see rationing since those priced out of the market will surely protest that at the rates at which funds are being loaned, they would borrow if the funds were offered.

13. Caves and Porter (1975).

Caves, R.E. and Porter, M.E., "From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition." Harvard Institute of Economic Research, Discussion Paper No. 401, 1975. (Forthcoming in Quarterly Journal of Economics.)

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Sharpe, William F., "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," in James Lorie and Richard Brealey, eds., Modern Developments in Investment Management (New York: Praeger, 1972).

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CHAPTER 10

RISK AND FINANCIAL STRUCTURE: DETERMINANTS AND RELATIONSHIP WITH PROFITABILITY

JOHN T. SCOTT

In Chapter 9 we explored the question of how a firm's characteristics influence investors' evaluation of its long-term assets. Theoretical analysis forged the link between those characteristics and the rate of return which the firm must offer on the assets it sells in order to secure liquid funds. Statistical research supported the hypothesis that investors demand a higher rate of return from firms with (1) greater variability in returns, (2) greater financial risk, (3) less market power, and (4) less diversified activities. Diversified firms with market power appeared to have an advantage in the market for corporate funds.

We now turn from the question of how investors' evaluations determine the required rate of return (reflected in the market value of the firm's stream of earnings) to the question of what factors in the firm's environment determine the riskiness of its operation, its financial structure, and the rate of return on the book value of its equity. The simultaneous determination of these factors has been explored in a stimulating study by Hurdle.[1] We augment the basic framework of her model with a fourth dependent variable, the cost of debt, so that regressions are used to explore the determinants of risk, leverage, the cost of debt, and profitability. As explained in the concluding section of this chapter, the next step is to model a finer breakdown of a firm's financial structure and its relationship to profitability. The present analysis suggests some of the difficulties that task will entail.

INTERRELATIONS AMONG RISKS, FINANCIAL STRUCTURE, AND PROFITABILITY

The role of theoretical analysis in this chapter is to identify the various environmental factors that should explain the firm's riskiness, financial structure, and profitability. The set of endogenous variables representing those traits should be simultaneously explained by a set of predetermined variables measuring the environmental factors.

A firm's riskiness (that is the variance of its net income) should be related to its size, diversification, and market power, and the instability of demand for the products it sells. Size should in itself reduce risk, since a larger firm can be conceptualized as an amalgam of several smaller ones in which any deleterious random disturbance for one of the smaller

"firms" can be spread over the pooled assets of all. Diversification should in itself reduce risk because of the risk-reducing effect of the covariances in efficient combinations of risky assets (see Chapter 9). The market power implicit in a strong cohesive oligopoly may imply a reduction in risk[2] as well as an ability to elevate profits, or it may imply an increased variability in profits around a higher mean.[3]

A firm's leverage, its ratio of debt to equity, should decrease as its profitability increases, because greater profitability implies a lower opportunity cost for using retained earnings rather than debt, internal rather than external financing. Leverage should increase with the growth rate of sales, because firms with fast-growing sales are expected to choose to finance with debt until certain that growth is permanent. This avoids watering down ownership in the firm.[4] Because financial risk increases as leverage increases, leverage might be expected to decrease as business risk increases.[5] The higher the firm's cost of debt, the lower we expect its leverage to be. We also expect that some of the slack resulting from market power will be taken in the form of reduced financial risk. If so, leverage will decrease as market power increases.

The firm's cost of debt should increase with its riskiness. Companies with a high growth rate in sales over the period under examination may have been highly uncertain, risky ventures at the beginning of the period, and so long-term debt may have been taken on at a high cost. Once the optimal leverage is attained, any increase of debt relative to equity should increase the cost of debt because interest rates rise with the riskiness of the firm's financial structure.[6] Size, diversification, and market power should all reduce the cost of debt because of these characteristics' favorable effects on investors' subjective evaluations of the firm's distribution of returns (see Chapter 9).

The firm's profitability should be higher during periods of rapidly growing demand because disequilibrium of capacity results in quasi-rents that persist until entry or capacity expansion has erased them. Up to a point, more debt can be used to increase the rate of return on equity, but too much debt hurts as interest costs rise. This hypothesis of course rests on the traditional position that there is an optimal capital structure for the firm.[7] The assumptions of the Modigliani-Miller theorem[8] are not considered relevant to the real world that we are analyzing, although surely important to our theoretical understanding. We expect that risky firms earn more, the high-risk set of projects bringing higher returns. We also expect that the firm's profitability will increase with its market power.

VARIABLES IN THE ANALYSIS

The endogenous variables include the variability of the firm's net income (SDP) relative to the firm's size measured by its total assets in millions of dollars (TOTA). Their quotient provides the measure (SDPA)

of each firm's riskiness. Leverage is measured by

LEV Ratio of debt to equity.

The cost of debt is measured by

ALNG Interest and amortization on long-term debt divided by long-term debt.

Profitability is measured by

PEQR Rate of return to book value of equity.

Among the predetermined variables, we try two alternative measures of market power:

C468 4-firm concentration ratio for the firm's primary industry in 1968.

POWER $= C468 + (\overline{C468}/\overline{MESC})\ (MESC) + (\overline{C468}/\overline{ADI})\ (ADI),$

where bars denote means of values taken over our sample, and unbarred values pertain to the firm's primary industry. Besides *C468* the components of *POWER* are:

MESC Average size of largest plants accounting for 50 per cent of employment divided by industry size.

ADI Advertising/sales, 1965.

POWER is thus an index that combines the variance in the three separate measures of market power in the firm's primary industry. *MESC* and *ADI* were transformed to equate their mean values to *C468*. *POWER* was devised in an attempt to circumvent the difficulty of including three such highly correlated variables in the same regression.

The variance in demand characterizing the firm's primary industry is measured by:

SSI = variability of sales;

SACI = mean proportional absolute change in industry sales.

The firm's size is measured by its total assets in millions of dollars (*TOTA*), its diversification by the weighted index of diversification (*DW*), and its growth rate of sales by *GRS*. Appendix A provides a complete description of the variables used in this chapter.

Table 10.1

Regression analysis of determinants of risk (SDPA)*

	Independent variables							Corrected	
Equation no.	CONSTANT	C468	POWER	TOTA	SSI	SACI	DW	R^2	R^2	Degrees of Freedom
1.	$8.6x10^{-2}$	$-1.4x10^{-3}$		$5.2x10^{-4}$				.67	.66	72
	(3.0)	(-2.7)		(12)						
2.	$5.9x10^{-2}$		$-2.6x10^{-4}$	$4.9x10^{-4}$				.67	.66	72
	(2.9)		(-2.6)	(12)						
3.	$7.0x10^{-2}$	$-1.3x10^{-3}$		$5.1x10^{-4}$	-.34		$3.1x10^{-2}$	.67	.65	70
	(1.9)	(-2.4)		(11)	(-.11)		(.91)			
4.	$7.3x10^{-2}$	$-1.3x10^{-3}$		$5.1x10^{-4}$		$-4.3x10^{-2}$	$3.1x10^{-2}$	.67	.65	70
	(1.7)	(-2.4)		(11)		(-.14)	(.90)			
5.	$5.0x10^{-2}$		$-2.4x10^{-4}$	$4.8x10^{-4}$	-1.2		.031	.67	.65	70
	(1.6)		(-2.3)	(11)	(-.40)		(.90)			
6.	$5.3x10^{-2}$		$-2.4x10^{-4}$	$4.8x10^{-4}$		-.11	.030	.67	.65	70
	(1.4)		(-2.4)	(11)		(-.34)	(.87)			

*The t-statistics are in parentheses below the coefficients.

ORDINARY LEAST SQUARES RESULTS FOR THE STRUCTURAL EQUATIONS

DETERMINANTS OF RISK

Table 10.1 presents OLS regressions for alternative specifications of the determinants of risk (SDPA). It immediately presents us with a considerable surprise: a positive and formidably significant relation between SDPA and size (TOTA). And the result is robust to dropping the large -asset outlier in the sample.[9] The only obvious explanation lies in managerial preferences and the large firm's opportunity set. For example, size and diversification may reduce overall riskiness in terms of the variance in returns, other things being equal, as we suggested on pages 227 and 228. But other things may not be equal. In particular, large, diversified firms may be run by managers who choose riskier projects either because of temperament or because their firms can afford more risk, and large-scale risks are at hand that may yield high profits. Controlling for variance in returns as we did in Chapter 9, we expect and find that the traits of diversification and market power reduce a firm's required rate of return because of the impact on investors' subjective perceptions of the skewness of the distribution of the firm's returns. But large, diversified firms may in fact experience greater variance in returns because their managers choose riskier projects.

The other results in Table 10.1 are more conventional. For this particular concept of risk, the data support Hurdle's hypothesis that an oligopolistic consensus effects a reduction in risk. The variance of industry demand surprisingly does not appear significantly positive as expected, but this may be because the demand variance for the firm's primary industry was used rather than a variance of the weighted average demand for the several industries in which the firm operates. The variability of companies' sales is related weakly to the variability of total sales in their markets (see Chapter 8), but the variability of company profits is unrelated to the variability of company sales.

These results for the determinants of risk have an interesting relationship to the findings of Hall and Weiss.[10] They report a positive relationship between company size and profitability, which they attribute to capital-requirements barriers to entry. They explicitly assume that the instability of sales within industries is independent of firm size, for firms as large as minimum efficient scale, and do not control for it.[11] But the simple correlation between size (TOTA) and risk (SDPA) in our sample, is +0.80, and the positive relationship persists in the partial correlations implicit in the several regressions of Table 10.1. Hall and Weiss's size-profit relationship could be explained by this unexpected but very strong size-risk relationship, although our sample makes no attempt to exclude firms of less than minimum efficient scale, and the relationship may not exist for their sample. Their conclusions as regards capital-requirement barriers may well be correct, but because they did not attempt to control for intraindustry differences in risk, and because such differences

Table 10.2

Determinants of leverage,

cost of debt, and rate of return to book value of equity OLS estimates for the structural equations*

	Regression equation						R^2	Corrected R^2	Degrees of Freedom
LEV =	.91	-5.4 PEQR	+2.0 GRS	-1.2 ALNG	+.37 SDPA	-2.4×10^{-3} C468	.47	.43	69
	(4.9)	(-7.0)	(3.1)	(-2.1)	(1.0)	(-.90)			
ALNG =	9.0×10^{2}	+.10 SDPA	-.14 LEV	$+2.1\times10^{-2}$ LEV^2	+.44 GRS	-1.0×10^{-4} TOTA	.24	.19	69
	(3.4)	(.82)	(-2.6)	(2.2)	(3.8)	(-1.3)			
PEQR =	5.1×10^{-2}	$+9.7\times10^{-3}$ SDPA	$+7.1\times10^{-2}$ LEV	-3.0×10^{-2} LEV^2	$+6.9\times10^{-5}$ POWER	+.14 GRS	.64	.61	69
	(3.4)	(.27)	(3.0)	(6.4)	(1.4)	(2.5)			

*The t-statistics are in parentheses below the coefficients.

are apparently correlated with firm size, the inference that they draw from their empirical work is perhaps unwarranted.

DETERMINANTS OF LEVERAGE

The first equation in Table 10.2 supports the expectations, discussed above (page 228), that LEV decreases as PEQR increases, increases as GRS increases, decreases as ALNG increases, and decreases as C468 increases. But instead of the expected negative relationship with SDPA, we find a positive relationship that is completely consistent with the surprising results for the determinants of risk. Perhaps firms with high business risk are run by entrepreneurs who opt for high financial risk as well.

DETERMINANTS OF COST OF DEBT

The second regression equation in Table 10.2 supports the relationships hypothesized above (page 228). Riskier firms pay more for debt as do firms that have experienced high rates of growth in sales. As well, after some point, increasing debt relative to equity results in a higher cost of debt. Larger firms pay less for debt, but as the specification below shows, we cannot distinguish a significant impact of market power or diversification.

$$\underset{(2.1)}{ALNG = .088} \; \underset{(.84)}{+.11SDPA} \; \underset{(-2.6)}{-.14LEV} \; \underset{(2.2)}{+.022\,(LEV)^2} \; \underset{(3.7)}{+.44\,GRS} \; \underset{(.16)}{+.00009\,C468}$$

$$\underset{(-.18)}{-.0068\,DW} \; \underset{(-1.3)}{-.00011\,TOTA}$$

$R^2 = .24$
Corrected $R^2 = .17$
d.f = 67

However, we assign a very low degree of credence to the regressions which attempt to explain ALNG, because the variable mixes the several maturities in the debt spectrum and because our company data include four extreme values for ALNG (three values greater than .20 [.36, .78, .57] and one value less than .04 [.012]). Dropping these values would be arbitrary, and in any case does not affect the results appreciably.

DETERMINANTS OF PROFITABILITY

The third equation in Table 10.2 supports the hypotheses about the determinants of profitability. GRS has the expected positive impact on profitability; the signs of LEV and LEV^2 support the traditional ideas about the importance of capital structure; market power has a positive

Table 10.3

Simple correlations between endogenous variables and their fitted values as calculated from OLS estimation of the reduced-form equations*

Variables	Simple correlation coefficient
SDPA and $\widehat{SDPA}$	.82
LEV and $\widehat{LEV}$	.29
ALNG and $\widehat{ALNG}$	.46
PEQR and $\widehat{PEQR}$	.28

* - See discussion in text for qualifications.

Table 10.4

Second-stage estimates for the determinants of rate of return on book value of equity (PEQR)*

	Independent variables							
CONSTANT	$\widehat{SDPA}$	$\widehat{LEV}$	$(\widehat{LEV})^2$	POWER	GRS	R^2	Corrected R^2	Degrees of Freedom
-1.7×10^{-3}	3.5×10^{-2}	.41	-.57	8.6×10^{-5}	.24	.20	.14	69
(-.027)	(.48)	(2.3)	(-3.2)	(.68)	(2.0)			

*The "t-statistics" (Kmenta, 1971, pp. 584-585) are in parentheses below the the coefficients.

impact on profits; and risky firms appear to earn higher profits. The profitability of companies is analyzed further in Chapter 11.

SECOND-STAGE ESTIMATES FOR THE STRUCTURAL EQUATIONS

Table 10.3 illustrates why the standard methods for escaping the simultaneity problem are not of much use in our particular case. Two-stage least squares avoids the simultaneity bias by using the fitted values (from the ordinary least squares estimates of the reduced form of the system of simultaneous equations) of the endogenous variables as instruments for those variables. These fitted values are by the definition of the least-squares estimation process uncorrelated with the residuals from the reduced form equations. They are then used as instruments which are ideally uncorrelated with the disturbances for the structural equations and yet highly correlated with endogenous variables.[12] Our problem is that the fitted values for two of our endogenous variables are not highly correlated with the endogenous variables themselves and are thus very poor instruments. Remarkably, as Table 10.4 shows, PEQR equation holds up anyhow, although the coefficients on LEV and LEV^2 change quite a bit in size. Note that we face an unusual problem in that one of the endogenous variables appears in both untransformed and squared forms. Formally, we have a system of simultaneous equations which is nonlinear in the endogenous variables, rather than the usual linear system of equations. Thus we do not have recourse to the standard textbook technology of deriving reduced forms which are linear in the variables. As an informal, ad hoc procedure, LEV^2 has been considered as a fifth dependent variable and its fitted value in the reduced form has been constrained to be the square of the fitted value for LEV. Note that two-stage least squares is equivalent to instrumental variables using the fitted values of the endogenous variables as their instruments, or to ordinary least squares using those fitted values as explanatory variables in place of their corresponding endogenous variables.[13]

THE DIRECTION OF FUTURE RESEARCH

The results of Chapter 10 and our general understanding can perhaps be improved by expanding the model to include a finer breakdown of the firm's capital structure. The expanded model could be used to explore the determinants of the relevant risk, cost, and amount for the firm's several categories of funds (short-term and long-term debt, common and preferred equity) and the relationship between the firm's detailed risk and financial position and its profitability. However, the difficulty of assembling complete data for an inclusive model may imply that the smaller models are the most reliable. No matter how large our model, until good instruments for our endogenous variables have been found (in effect, until we have found a set of exogenous variables with substantial explanatory power) perhaps a greater degree of confidence should be assigned to the "inconsistent" ordinary least squares results for the structural equations than to the "consistent" second-stage estimates.

NOTES TO CHAPTER 10

1. Hurdle (1974), pp. 478-85.

2. *Ibid*., p. 480.

3. Caves and Yamey (1971), pp. 513-17.

4. Hurdle, *op. cit.*, p. 480.

5. Van Horne (1971), pp. 198, 229.

6. *Ibid*., pp. 208-10.

7. *Ibid*.

8. *Ibid*., p. 211.

9. The assets of firms in the sample range from $2.3 million to over $1,400 million. There is a jump between the $900 million range and the largest company.

10. Hall and Weiss (1967), pp. 319-31.

11. *Ibid*., p. 323.

12. Kmenta (1971), pp. 559-60.

13. *Ibid*., pp. 560-62.

Caves, R.E., and B.S. Yamey, "Risk and Corporate Rates of Return: Comment, "Quarterly Journal of Economics, 85 (Aug. 1971), 513-517.

Hall, M., and L.W. Weiss, "Firm Size and Profitability," The Review of Economics and Statistics, 49 (Aug. 1967), 319-331.

Hurdle, Gloria J., "Leverage, Risk, Market Structure and Profitability," The Review of Economics and Statistics, 56 (Nov. 1974), 478-485.

Kmenta, Jan, Elements of Econometrics (New York: Macmillan, 1971).

Van Horne, James C., Financial Management and Policy (Englewood Cliffs, N.J.: Prentice-Hall, 1971).

PART FIVE

MARKET PERFORMANCE AND INDUSTRIAL EFFICIENCY

Chapter 11

EFFICIENCY, SCALE AND TRADE IN CANADIAN AND UNITED STATES MANUFACTURING INDUSTRIE

A. Michael Spence

INTRODUCTION

The Canadian and U.S. economies are in many respects very similar. The technologies available to them are substantially the same, though the technologies employed may differ. The tastes of their peoples, while not identical, do not differ by much, and probably by less than the differences between any other pair of countries. Thus, a comparison of the two economies provides a unique opportunity to study the effects of the principal difference between the two countries, the size of the market. This is the primary purpose of this investigation. One does not expect market sizes that differ by a factor of roughly ten to have the same effects on every industry. On the contrary, the comparable characteristics of the Canadian industry and its U.S. counterpart are quite likely to differ considerably from industry to industry for a variety of reasons. One is that the importance of economies of scale in a variety of components of costs vary from industry to industry. Second, the tariff barrier and, therefore, the trade flows differ significantly from one industry to the next.

As a result, the study of the comparative properties of matched Canadian and U.S. industries is likely to lead to a better understanding of the industries and of the underlying structural forces that are giving rise to the performance that is observed in either country.

It is only fair to warn the reader at the outset that the methodology for using industry data from two or more countries to draw inferences about industrial structure is far from perfected, and the present report should be viewed as a preliminary effort in this direction.

The potential for improving upon inferences based solely on data from one country seems sufficiently great to warrant attention. When data from one country are used, it is difficult to control for interindustry differences. With two countries, there are two sets of observations on the same industry, although they are, of course, related by virtue of the trade flows, which are rarely cut off completely, even by relatively high tariffs.

This study has many components, and it is not easy to describe all of them in advance. It may therefore be most useful to outline what one expects to be the effects of the bifurcation of the North American market by tariffs of varying heights.[1] This exercise, which can be thought of as rough and ready theory, will provide a guide in carrying out the comparative

analysis of the data that have been assembled.

THE EFFECTS OF THE TARIFF AND THE DIVISION OF THE MARKET

Many, if not most, of the industries we have data on are to some extent differentiated product industries. It is therefore of some importance to recognize the fact of differentiation at the outset, and to integrate it into the argument concerning the likely effects of tariff barriers and the division of the market. Unfortunately, the data on differentiation is meager. One observes its effects only indirectly. Nevertheless, unless these effects are anticipated, some of the directly observed effects will not be comprehensible.

One begins by presuming that the industries are subject to increasing returns to scale. The extent of the increasing returns will vary considerably from industry to industry. In a single product industry, the effect of the smaller market size is to raise unit costs in Canada, unless the wage differentials outweigh the efficiency differences. If the tariff is low enough, there is an additional possible effect. Some goods may be manufactured in the larger market area, the United States, and imported into Canada. Obviously this will not occur for all goods or all industries. There is a general equilibrium effect that I do not have the time to delve into here.

With a differentiated product industry, the effects are more complex. Unit costs for goods that are produced in both countries will be higher in Canada, with the same proviso about wages and other factor prices. There is also a proviso concerning absolute cost advantages that may occur for Canada in certain industries, like pulp and paper. Unfortunately, we do not observe the costs for specific products, and cannot test this simple hypothesis directly. Thus it is necessary to pay attention to what happens to the distribution of differentiated products within the industry. A likely outcome is that the products with the smaller market shares will be produced in the United States and imported into Canada. The products with the larger market share may be produced in Canada, because the larger market share means that the economies of scale can be at least partially realized in the Canadian economy. For these goods, the cost disadvantage in Canadian production is outweighed by the tariff.

Therefore, in a differentiated-product industry, one is likely to observe several effects that are implied by the model outlined above. The Canadian industry is likely to be more concentrated. Product by product the Canadian industry will have lower productivity. But since the products with the lowest productivity will have been eliminated from the Canadian manufacturing sector, the overall or average result is indeterminate. The more extensive the increasing returns, the more likely is the U.S. industry to be the more efficient.

As we shall see later, the data provide us with a variety of incomplete measures of efficiency, costs, and performance. When we come to them, I shall comment on how the model outlined above affects one's expectations about these variables.

It is possible that the tariff and the smaller market size in Canada will result in a reduced range of products available in Canada. They may be priced out of the market. If this occurs, then the small-market-share end of the U.S. distribution of products within the industry will be eliminated altogether in the Canadian industry.

Slightly more generally, the effect of the tariff is to knock out the products in the Canadian manufacturing industry with the highest costs relative to its U.S. counterpart. These are likely to be the products with the smaller market shares. It is possible, however, that the products with the greatest cost disadvantage will not be those at the small end of the market share spectrum. Again, this will have implications for what one observes in the data.

THE QUESTIONS AND PROBLEMS TO BE ADDRESSED

The preceding model begins with the presumption of increasing returns and declining costs and draws conclusions about the observed characteristics of matched pairs of industries, one in each country. Later, we shall elaborate on these conclusions after discussing the available data. But it is worth noting that the observed attributes of industries depend upon a variety of underlying features that are not directly observed: the degree of product differentiation and the extent of the increasing returns, to name two. One of the questions then is what we can infer about the structure of particular industries from observing the comparable characteristics of the Canadian and U.S. versions.

A prior question is whether and in what respects the economies and specific industries within them differ. Because most industries have many facets, it is a complex task to describe accurately and in a digestible form what the differences are.

A third task we have set for ourselves is to account for the differences in the industries in terms of exogenous and structural aspects of markets. Much of what follows is concerned with this.

There is a fourth issue. It is whether and to what extent we can account for differences in costs and productivity in conventional economic terms, that is in terms of economies of scale, product differentiation, size of market, and so on.

Fifth, and finally, one would hope to be able to draw policy-related conclusions about the effects of adjusting certain aspects of the environment in which the economy operates. The tariff obviously attracts attention.

But it may also be possible to comment on the effects of a policy of deconcentration in Canadian industry.

THE DATA

The data pertain to a set of 83 matched Canadian and United States industries, a subset of the 123 industries employed in this report (see Appendix A.) The 83 industries are listed in Table 11.1. These industries are comparable for the period prior to 1970. Most of the data are for 1967 and 1968. The Standard Industrial Classification is the three-digit Canadian one for the period prior to 1970.

The present study will focus on the data listed in Table 11.2. I present it here largely because it will give perhaps the best indication of the focus of attention. The variables deal with tariffs, trade flows, concentration, and a variety of measures of industry performance.

Table 11.1 Industries in the Comparative Study

Canadian SIC Code*	Industry
101	slaughtering, meat packing
103	poultry processors
105	dairy & cheese
111	fish products
123	animal feeds
128	biscuits
129	bakeries
131	confectionary
133	cane & beet sugar
135	vegetable oils
141	soft drinks
143	distilleries
145	breweries
147	wineries
151	leaf tobacco
153	tobacco products
161	rubber footwear
163	tires & tubes
172	leather tanneries
175	leather gloves
193 197	wool yarn and cloth
212	thread mills
213	cordage & twine
214	narrow fabric mills
215	pressed & pinched felt
216	carpets and rugs
218	textile dying and finishing
221	canvas products
223	cotton and jute bags
231	hosiery mills
246	fur goods
248	foundation garments
251	saw & planing mills
252	veneer and plywood
258	coffin and casket
261	household furniture
264	office furniture
271	pulp and paper mills
288 289	publishing & printing

Canadian SIC Code	Industry
291	iron and steel mills
292	steel pipe and tube
294	iron foundaries
295	smelting and refining
296	aluminum rolling
297	copper rolling
301	boiler and plate
302	fabricated structural metal
303	ornamental, architectural metal
305	wire and wire products
306	hardware, tool, cutlery
311	agricultural implements
318	office and store machinery
232	
325	motor vehicles & parts
324	truck body and trailer
326	railway rolling stock
327	ship building
328	boat building
331	small electrical appliances
332	major appliances
334	household radio & TV
336	electrical industrial equipment
337	battery manufacturers
338	electric wire & cable
341	cement
343	lime manufacturers
345	gypsum products
347	concrete products
348	ready-mix concrete
352	refractories
353	stone products
357	curasives
365	petroleum refineries
373	plastics and synthetic resins
374	pharmaceuticals
375	paint & varnish
377	toilet preparations
381	clocks, watches, opthalmic good
382	jewellery & silverware
383	brush, broom, mop
393	sporting goods, toys, games

Table 11.2 The Variables

Notation	Variable : Definition and Comment
NOT	Canadian nominal tariff: in advalorem terms
EFT	Canadian effective rate of protection: takes into account tariffs on inputs imported to Canada
LAB2	Capital intensity: for each country
C4	Concentration: 4 firm, for each country
WPW	Wages: of production workers both countries
WNP	Salaries of nonproduction workers
NPW	Proportion of nonproduction workers in the labor force
CNPR	A 0-1 dummy for producer or consumer goods, consumer goods are 1
CONO	A 0-1 dummy for convenience and non-convenience goods. A distinction among consumer goods, introduced by Porter, indicating how a product is retailed. Convenience goods are 1.
ROI	Rate of return on investment for both countries.
SSI	Variability of sales in Canada.
SACI	Growth of sales in Canada.
MES	Minimum efficient scale in each country, defined as the shipments of the average sized plant of the largest accounting for 50% of industry shipments, divided by total industry shipments.
OWN	Inbound diversification for each country, the fraction of value added attributable to plants of multi-plant firms not classified to the industry.
SPL	Outbound diversification: one minus the fraction of value added of enterprises classified to the industry attributable to this industry.
VPW	Value added per worker for each country.
RPR	The ratio of value added per worker in Canada to the same for the USA.
TRN	Transportation costs, constructed by Scherer.

Table 11.2 Continued

Notation	Variable : Definition and Comment
IMP	Canadian imports as a fraction of shipments.
EXP	Canadian exports as a fraction of shipments.
FSE	Fraction of sales of enterprises 50% or more foreign controlled.
VRT	Value added over shipments for each country.
VPE	Value added per establishment for each country.
PCM	Price-cost margin for each country, defined as value added minus payroll over shipments.
LABI	Payroll over valued added in Canada divided by the same figure for the U.S.
CRD	Value added per worker in the "small" firms divided by value added per worker in the large for each country. This is thought to measure economies of scale, but that interpretation is somewhat messed up by imports and product differentiation.
REG	A 0-1 dummy if industry is regionalized. A regionalized industry is a zero.
RPAS	Value added per worker in plants in Canada below American MES divided by same for USA.
RPAL	Value added per worker in plants in Canada above American MES divided by the same for USA.
BIGE	Fraction of Canadian value added from plants above American MES.
ADI	Advertising to sales ratio for each country.

MEASURES OF EFFICIENCY AND COST

The data do not provide a direct measure of labor productivity or costs. Value added per worker, commonly used as a measure of productivity, contains at least three different economic quantities. It contains labor productivity, differences in wages or salaries, and differences in price-cost margins. It is useful to try to separate these variables. It can be done if one is prepared to make an assumption about prices in the two countries, that each commodity price in Canada equals its U.S. price plus the Canadian nominal tariff. The argument is as follows. Let

p_c = Canadian price

p_u = American price

e_c = output per worker in Canada

e_u = output per worker in the USA

c_c = unit costs in Canada

c_u = unit costs in the USA

v_c = value added per worker in Canada

v_u = value added per worker in the USA

a_u = unit costs of materials in the USA

a_c = unit costs of materials in Canada

n = nominal tariff

t = tariff on inputs

m_c = price cost margin in Canada

m_u = price cost margin in USA

q = the effective rate of protection

w_c = wages per worker in Canada

w_u = wages per worker in USA

The relations among these variables are as follows: value added per worker is

$$v_u = (p_u - a)e_u$$

$$v_c = [p_c - (1+t)a]e_c \; .$$

Unit costs are

$$c_u = \frac{w_u}{e_u} + a$$

$$c_c = \frac{w_c}{e_c} + (1+t)a \; .$$

Price cost margins are

$$m_u = 1 - \frac{c_u}{p_u}$$

$$m_c = 1 - \frac{c_c}{p_c} \quad .$$

Now the assumption on price is that $p_c = (1+n)p_u$ and $a_c = (1+t)a_u$. That is, the prices of all traded goods in Canada are equal to the U.S. prices times one plus the nominal ad valorem tariff. If this is true, then the effective rate of protection is

$$1 + q = \frac{p_u(1+n) - (1+t)a}{p_u - a}$$

$$= \frac{v_c}{e_c} \cdot \frac{e_u}{v_u} \quad .$$

Therefore the ratio of efficiencies is

$$\frac{e_c}{e_u} = \frac{v_c}{v_u(1+q)} \quad .$$

The right-hand side consists of measurable variables, and therefore we can use this derived variable as an approximate measure of relative output per worker.

It would also be useful to have a measure of relative costs. Given the assumption about prices, that ratio is

$$\frac{c_c}{c_u} = (1+n)\,\frac{(1-m_c)}{(1-m_u)} \quad .$$

Again, the right-hand side is measurable and hence can be computed using the data just described. These two variables will be used in the analysis which follows.

There is another somewhat crude approximation to labor efficiency. It is

$$ZF = \frac{w_c}{w_u} \cdot \frac{c_u}{c_c} \quad .$$

This can be taken as an alternative to the previous measure and used as a check against it.

Relations Among the Variables

The variables that measure efficiency and related quantities are in turn related by some identities. It is important to be aware of these at the outset. For example,

$$PCM = \frac{VA - Payroll}{Shipments} = VRT(1 - \frac{Payroll}{VA}) \ .$$

Here VA is value added. Payroll over value added can be taken as a measure of labor or capital intensity. It is, in fact, labor share. The term in brackets is capital share. The remaining component is value added over shipments. It contains all the "rents". Similarly,

$$VPE = VET(\frac{Shipments}{Establishments})$$

or the ratio of VPE/VRT is simply the average sized establishment.

Value added can be written

$$VA = rk + wL$$

where r is the return to capital and w the wage rate.

It follows that

$$\frac{VA}{L} = \frac{rk}{L} + w.$$

Therefore value added per worker is determined by (1) wages (2) capital labor ratio and (3) all the factors that affect the rate of return to capital, including entry barriers, oligopolistic collusion, and labor productivity. Thus it is relatively easy to see that VA/L is not a pure measure of labor productivity.

Some Methodological Considerations

Empirical research of the type carried out here is difficult because certain important variables that determine industry performance are not directly observed. The "model" with which most researchers operate begins with a set of exogenous variables or characteristics of a market. The model implies a set of outcomes some of which measure structure, others performance. A sample of each is shown in Figure 11.1.

Figure 11.1

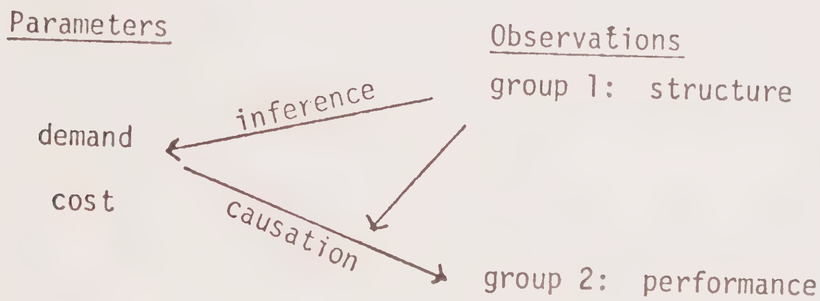
Exogenous Variables		Observations
technologies		rate of return
costs		concentration
factor prices		prices and margins
demand elasticities and structure	causation →	firm and establishment sizes
consumer information	← inferences	numbers of products
		advertising
		sales expenditures
		sales
		costs

Some of the observed structural characteristics affect others directly. For instance, concentration is believed to influence price-cost margins. However many of the observed characteristics are determined by both exogenous parameters and observed structural characteristics.

The fact that important characteristics are unobserved makes testing of the model difficult. One strategy which is adopted is the following (sometimes it is implicit in the research design). A subset of the observations are used to predict or guess at the exogenous characteristics. These observations plus the guesses then imply values (or ranges) for the remaining observed characteristics.

A partial test of the theory is how well and significantly one class of observations predicts another on a cross industry basis. Of course there is often an identification problem. Part of the influence of a structural variable may be due to an underlying variable which influences structure as well as performance (see Figure 11.2). Researchers are generally quite frank in recognizing this sort of problem.

Figure 11.2



One of the principal attractions of the two country approach, when the countries have similar tastes and similar technological underpinnings, is that is provides a richer set of data upon which to infer the exogenous parameters from observations. In terms of the preceding schematic model, we have

Figure 11.3

Exogenous Parameters		Observations
(presumed the same in both countries)		Country 1
		Country 2
tariffs	→	
other impediments to trade		Trade flows
differences in scale of market		

Since there are observations on both countries as well as observations on trade barriers, there is more evidence with respect to the parameters that characterize any particular industry.

The promise then, of the two country study, is the possibility of identifying parameters more accurately and thereby testing the model more precisely. The mode of analysis, however, is not changed. It will continue to be indirect in that the inferences run from observed characteristics to underlying parameters, then back to observations.

In the present study, I have not fully exploited this potential, largely for lack of time. However, an application of the approach sketched in Figure 11.3 above is used to study the comparative characteristics of the industries in the two economies. More specifically, the analysis uses industry observations, principally ones for the U.S. industry, to infer unobserved characteristics, and these in conjunction with the observations are used to explain trade flows and various dimensions of comparative performance in the Canadian industry. Thus for purposes of the study, we divide the observed variables into two groups, exogenous and endogenous ; (see Table 11.3).

Table 11.3

Endogenous	Exogenous
Canadian exports	Nominal tariff for Canada
Canadian imports	Effective rate of protection
Foreign ownership	US concentration
Ratio of value added per worker	Convenience - nonconvenience dummy
Ratio of price cost margins	Consumer-producer dummy
Relative labor intensities	U.S. rate of return
Ratio of value added/establishment	U.S. and Canadian wages
Ratio of value added/workers for small establishments	U.S. and Canadian salaries for non-production workers
Ratio of value added/workers for large establishments	Fraction of non-production workers in both countries
Canadian concentration	Sales growth
Advertising/sales Canada	Regional dummy
Canadian rate of return	U.S. minimum efficient scale
Canadian "minimum efficient scale"	Relative capital intensity

The idea is that the exogenous variables collectively explain some fraction of the variance in the endogenous variables. Each endogenous variable may depend on other endogenous variables and upon exogenous variables. In implementing this research (discussed later) ordinary least squares are used. In future research simultaneous equations estimation procedures will be used.

The latter are rendered complicated by the missing observations, which are not scattered randomly across variables and industries.

Increasing Returns, Differentiated Products

As a preamble to the data analysis that follows, it may be useful to set out how the variables and statistics may be derived from an underlying structure of costs and technology. For it is important to think of many of the variables as statistics reflecting distributions of products, costs and related variables in a differentiated product industry.

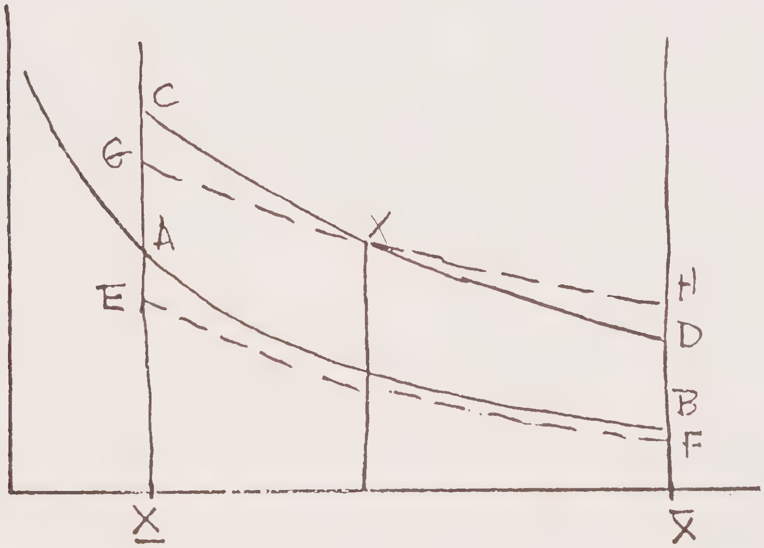
Let us assume that there is a distribution of products categorized by the size of their markets in the United States. Let X be U.S. sales in physical units. The U.S. industry consists of a spectrum of products, from smallest to largest, defined by their sales. We assume the average cost curves are similar for each product in the spectrum. For concreteness assume average costs have the form

$$A(X) = a + BX^{-\alpha}$$

for $\underline{X} \leq X \leq \overline{X}$.

The average costs for a typical firm in the industry are shown in Figure 11.4 (line AB).

Figure 11.4



Now the Canadian market is 1/10 the size of the U.S. market. Thus a product with size X in the United States will have sales of X/10 in Canada. Thus using the U.S. market as reference, Canadian average costs, on the spectrum of products, are shown as CD in Figure 11.4.

A tariff raises the costs of imports to Canada by an amount $\underline{t}$ of the U.S. average cost. The dotted line EF shows average costs if the good is produced entirely in the United States. If we add the tariff, $\underline{t}$, to that, we get the cost in Canada if the good is produced in the United States (dotted line GH). The dotted line GH intersects Canadian costs at the point X*. Goods with sales in the United States of $X \geq X^*$ will be manufactured in Canada. Those with sales in the United States below X* will be manufactured in the United States and imported.

Imports will (in somewhat noncomparable physical units) be the sum of the sales below X* divided by 10. Canadian average costs will be above those for the United States, but perhaps not by much because the small end of the distribution of products by share has been removed from the Canadian manufacturing sector by import competition. In drawing these curves, I have implicitly assumed factor prices are the same in each country, but the model is easily modified when that assumption is relaxed, at least for labor costs.

The Canadian industry is therefore likely to be a truncated version of U.S. industry. The truncation tends to mitigate the effects of increasing returns on observed average costs and labor productivity in Canada.

Descriptive Features of the Data

The comparable data on the various industries in the two countries suggests several interesting conclusions.

Value added per worker is generally lower in Canadian industries. The exceptions are breweries (145), leaf tobacco products (151), thread mills (212), saw mills (251), office machinery (318), cement (345), refractories (352) and stone products (353). In Table 11.4 the unusual industries are shown along with some accompanying variables. The Canadian industries with relatively high value added per worker appear to have high concentration, high capital intensity relative to the United States and, in the case of leaf tobacco products, a very high price-cost margin. In general, it would be inappropriate to conclude that these are Canada's more efficient industries. It is probable that these figures result in part from differences in wages and price-cost margins.

Table 11.4

Industries Where Canadian Value Added Per Worker is Above the US Figure

	RPR67	PCMU	CN468	US468	Ratio of Wages	Relative Labor Intensity	Imports	EFT
145	101	1.17	94.8	40	.79	8.15	4.4	12.2
151	129	1.47	--	63	1.01	7.56	4.3	--
212	102	1.32	80	53	.88	10.1	--	-8.8
251	101	.88	23	11	1.02	10.35	5.7	3.7
318	124	1.09	84	73	1.09	8.66	70.7	17.3
345	100	.93	95	80	.94	9.61	1.5	39.0
352	114	1.00	75	40	.83	7.81	89.3	5.2
353	105	1.16	21	18	.90	8.72	38.0	20.0
Mean	79.4	.90	56.1	38.0	.87	11.3	.28	26.6

The Ratio Variables

Several simple observations can be made from the ratios of Canadian and U.S. variables (see also Table 11.5).

1. With few exceptions, the Canadian industry is more concentrated than its American counterpart, and the differences are striking.

2. With few exceptions, the salaries of Canadian nonproduction workers, and the wages of Canadian production workers are below the U.S. counterpart.

3. The fraction of nonproduction workers is, with very few exceptions, higher in the Canadian industry than in the U.S. counterpart. Moreover this variable turns up repeatedly as significant in explaining the difference between Canadian and U.S. productivity. It does not seem far-fetched to suggest that nonproduction personnel per unit of output declines with scale, and that this is an important aspect of increasing returns.

4. The price-cost margin, whose flaws have been discussed elsewhere, is generally higher in the United States. Surprisingly, the variance of this ratio is quite large, because it "contains" capital labor ratios.

The fact that the Canadian margin is often lower suggests that the tariff or effective rate of protection is not high enough to balance the U.S. cost advantage, and that for many industries, foreign competition holds the Canadian prices down. To some extent the rate-of-return figures, which are lower in Canada, bear this out. The U.S. rate of return figures are high in this period because of the war in Vietnam.

Table 11.5

Variable	Canadian Mean	Canadian Std. Dev.	US Mean	US Std. Dev.	t-stat.*
PCM	22.2	9.57	25.1	9.97	1.92
VPW	11.8	5.64	15.3	7.73	3.39
VPE	25.4	59.5	22.3	27.2	.42
VRT	46.7	14.07	46.35	13.5	.15
MES	7.24	5.46	2.85	2.47	6.72
CONC	56.14	24.4	38.2	19.65	5.24
WPW	2.44	.57	2.8	.62	3.91
NPW	28.3	15.1	21.66	11.58	3.2
WNP	6.84	.82	8.75	1.59	9.76
ROI	9.79	4.29	14.8	5.0	6.97

*A value exceeding 1.70 indicates a probability of less than 5% that the means are the same.

In the next section, we shall see that the tariff is not an isolatable statistically significant determinant of price-cost margin, but that relative labor intensity is. That is consistent with the hypotheses that there is a ceiling on the Canadian price and that costs determine the margin (and probably also the rate of return).

5. Canadian value added per establishment is below the U.S. figure more often than it is above, but not that much more often. There are two reasons for this. Canadians may produce more per plant and ship it further since relevant geographic density is lower in Canada. Second, Canadian plants are sometimes multiproduct plants while the U.S. counterpart industry more often consists of a collection of plants with few products per plant. The extreme case is the automobile industry, where the average value added per establishment in Canada was (in 1967) over 6 times that in the U.S. industry.[2]

6. Value added per worker is with few exceptions lower in Canada than in the United States. The exceptions (discussed elsewhere) appear to occur in highly concentrated, capital-intensive industries.

7. If ZE is taken as the measure of relative labor productivities, then labor productivity is smaller in Canada, and often by quite a lot. Its mean is 0.645, and the standard deviation is 0.1814.

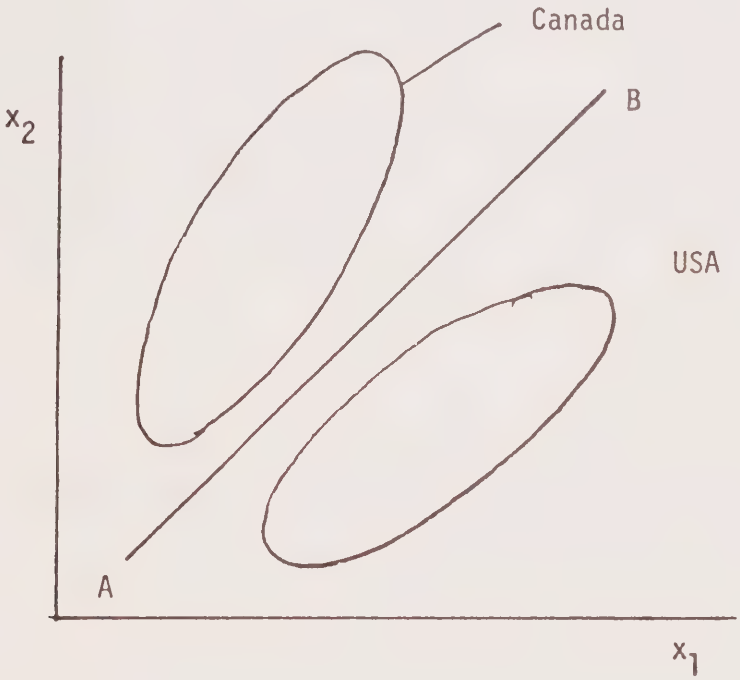
DISCRIMINANT ANALYSIS

Perhaps the strongest possible test of whether Canadian and U.S. industries are different is whether, on the basis of a set of scale-free measures of performance, one could tell whether the industry were Canadian or U.S. without

knowing what industry it was. Intuitively, this should be nearly impossible because of the large inter-industry differences within a country. These differences should certainly swamp the inter-country differences between pairs of industries. However, in a recent paper, Oksanen and Williams have shown that it is possible to discriminate between Canadian and U.S. industry with great accuracy.[3] In this section, a version of their discriminant analysis approach is applied to the 84 industry sample.

The reason why it may be possible to discriminate is most easily seen by using a two-variable example. Suppose there are two variables, X_1 and X_2. Their distribution in Canada and the United States is shown in Figure 11.5. The ellipsoids contain 95 percent of the probability. Two points are worthy of note. First, the line AB separates the countries fairly well. Second, that is true in spite of the fact that neither variable singly would discriminate at all well, because of the inter-industry variation within each country.

Figure 11.5



The variables with which we are discriminating, are listed in Table 11.6.

Table 11.6

1. Value added per worker	6. The fraction of non-production workers
2. Value added per establishment	7. Four firm concentration ratio
3. Value added over shipments	8. Minimum efficient scale
4. Production workers wages	9. Price cost margin
5. Non-production workers wages	10. Rate of return

We refer to these variables as $(X_1,\ldots,X_{10}) = X$ with a superscript c or u for Canada and the United States respectively. In each country they are normally distributed with means $\overline{X}^c$ and $\overline{X}^u$ and variance-covariance matrices V^c and V^u. The vector X is a random vector with the distribution

$$\frac{1}{2}f_c(X) + \frac{1}{2}f_u(X),$$

where f_c and f_u are the distributions for Canada and the United States respectively. In general, this distribution is not normal. Let S be a variable that takes the value 1 if the industry is American and -1 if it is Canadian. Let the mean of S be $\overline{S}$ and the mean of X be $\overline{X}$. Suppose we want to construct a linear combination of the X that is as highly correlated as possible with S. Let

$$m \equiv \mathrm{cov}(S,X)$$

and

$$\Omega = \mathrm{var}(X).$$

Let $t = \alpha^T X$. Then the variance of t is $\alpha^T \Omega \alpha$ and the covariance of t and S is $\alpha^T m$. Therefore the square of the correlation coefficient of S and t is

$$\rho^2 = \frac{(\alpha^T m)^2}{\alpha^T \Omega \alpha} .$$

Note that the variance of S is one. The solution to this problem yields an α that is unique only up to a scalar multiple. The solution is

$$\alpha = \Omega^{-1} m ,$$

and

$$\rho^2 = m^T \Omega^{-1} m .$$

It remains to compute m and Ω for the particular distribution of variables that we have. That will illustrate how the means and variances function in constructing the random variable t. A small amount of calculation produces the result

$$m = \frac{1}{2}(\overline{X}^u - \overline{X}^c) = \frac{1}{2}\, y$$

and

$$\Omega = \frac{V^u + V^c}{2} + \frac{1}{4}\, yy^T$$

where $y = 2m = \overline{X}^u - \overline{X}^c$. Let $V = \dfrac{V^u + V^c}{2}$. One can show that

$$\rho^2 = \frac{z}{4+z},$$

where $z = y^T V^{-1} y$.[4] Note that as y becomes large, the correlation coefficient approaches ρ. As V^{-1} becomes "large" meaning the variances are small, $\rho \to 1$ as V^{-1} gets small (i.e., large variances) $\rho \to 0$. This technique was applied to the data described above with the following results.[5]

The variable t has a two humped distribution resulting from its two normal components X^u and X^c (see Figure 11.6).

Figure 11.6

If one were going to use t to predict S, one would say that S is -1 if $t \leq \overline{t}$ in Figure 11.6 and conversely. The point $\overline{t}$ is the intersection of the two component normal distributions.

For the Canadian data, the results are as follows. The combined probability of an error (that is classifying a Canadian industry as U.S. or the reverse) is 4.23 per cent. That is quite remarkable, given the variance in any of

these variables across industries. The correlation of t with the country dummy is 0.865019. The means and standard deviations of t^u and t^c are as shown in Table 11.7.

Table 11.7

	mean	standard deviation
Canada	1.379	.446
USA	2.875	.422

The cutoff level of t ($\bar{t}$ in Figure 11.6) is 2.154. The probability of classifying U.S. industry as Canadian is 4.36 per cent. The probability of classifying Canadian industry as U.S. is 4.09. The average is the 4.23 per cent reported above. That is to say a randomly drawn industry will be misclassified 4.23 per cent of the time, rather an extraordinary amount of accuracy.

Table 11.7 summarizes the means, standard deviations, and weights for each variable. The weights by themselves do not mean much. Most of them have the same sign as the difference in the means. That is not a necessary consequence of the statistics, but neither is it unexpected. For each of the weights, we have computed the following numbers as a rough measure of the extent to which the variable is discriminating:

$$e_i = \frac{|\alpha_i(\bar{X}_i^u - \bar{X}_i^c)|}{e},$$

where

$$e = \sum_{j=1}^{10} |\alpha_j(\bar{X}_j^u - \bar{X}_j^c)| .$$

These weights are shown in Table 11.7. It is apparent that in 1967, the powerful discriminating variables were nonproduction workers' salaries (WNP), concentration (CONC), rate of return on investment (ROI) and price-cost margin (PCM).[6] The weakest variables, as one might expect, were value added per establishment (VPE) and value added over shipments (VRT). A test for inequality of the means for single variables showed that the means are different with a high probability for every variable except VPE and VRT. For those two, there is little confidence that the means are different, rather an interesting result in itself. While it is expected for VRT, VPE is subject to a host of conflicting forces. One might have guessed that value added per establishment would be higher in Canada on average. The sample mean is higher, but not much.

One might ask how well a single variable discriminates between the Canadian and U.S. industry. Consider nonproduction workers' salaries, with the highest e_i.

Table 11.8

Variable	Canadian Mean	Canadian Std. Dev.	US Mean	US Std. Dev.	Weights α	t-statistic for different means	Weights e_i (in percentages)
PCM	22.2	9.57	25.1	9.97	.05	1.92	.092
VPW	11.8	5.64	15.3	7.73	-.03	3.39	.067
VPE	25.4	59.5	22.35	27.2	-.0017	.42	.003
VRT	46.7	14.07	46.35	13.5	-.0329	.15	.007
MES	7.24	5.46	2.85	2.47	-.03218	6.72	.082
CONC	56.14	24.4	38.2	19.65	-.0102	5.24	.106
WPW	2.44	.57	2.8	.62	.21324	3.91	.044
NPW	28.3	15.1	21.66	11.58	-.01379	3.2	.053
WNP	6.84	.82	8.84	1.3	.32413	9.76	.376
ROI	9.79	4.29	14.8	5.0	.058	6.97	.169

This is by far the best single variable because of the small Canadian variance. If it is used to discriminate, the probability of classifying a Canadian industry as U.S. is 24.5 per cent. The probability of classifying a U.S. industry as Canadian is almost 14.2 per cent and the probability of an error on a randomly selected industry is 19.4 per cent.[7] The other single variables do worse than this.

THE DETERMINANTS OF EFFICIENCY AND FOREIGN TRADE FLOWS: REGRESSION ANALYSIS[8]

Admitting the problem of biases in the parameters derived from ordinary least squares regressions, it nevertheless seemed useful to explore the relations among the variables using simple regressions. This produced some rather interesting results which are reported in this section.

LABOR PRODUCTIVITY

We first looked at the determinants of labor productivity, the measure of which was developed in an earlier section. It is essentially the ratio of value added per worker in the two countries, divided by one plus the effective rate of protection. The underlying assumption is that Canadian prices rise to the levels permitted by the nominal tariffs.

The best equation is the following:

Dependent Variable: Labor Productivity (ZE).
Independent Variables:

	Coefficient	β	t-statistic
Convenience - nonconvenience	-.0584	-.139	1.67
MES USA	.0155	.201	2.01
Effective rate of protection	-.0063	-.713	9.7
NPW67/NPWUS	2.011	.234	3.20
ADI	-.016	-.224	2.68
US468	-.0021	-.210	2.14

Degrees of freedom	61
Adjusted R^2	.65497

The coefficient on the tariff is to be expected because of the way in which the variable is defined. Apart from that the remaining variables are quite significant, both statistically and in terms of their impact on ZE (labor efficiency).

Production scale in the United States (MESU) is important. Advertising (ADI) captures elements of product differentiation and economies of scale. The relative numbers or fractions of nonproduction workers are important, but the variable (NPW67/NPW US) has the wrong sign. One would expect, on the one hand, that higher overhead in Canada would reduce efficiency. But higher overhead means higher costs and these tend to appear in value added. Thus one is led to conclude that the dependent variable is not entirely free of relative cost components. That is, if costs are higher in Canada, ZE will tend to be higher.

In another regression, CDRU was significant. Since CDRU is a rough measure of economies of scale in the United States, its significance is to be expected.

Dependent variable

Labor efficiency (ZE)

Independent Variables		t - statistic
FSE	-.1549	1.77
MESU	-.1062	.98
CDRU	.1357	1.52
EFT	-.630	7.42
NPW67US	.312	3.61
SSI	.137	1.62
US468	.101	.91
Adjusted R^2		.5937
Degrees of freedom		54

It is to be remembered that MESU, CDRU, and US468 are all highly correlated, so that they tend to knock each other out.

RELATIVE COSTS

The theory says that relative costs are determined by relative efficiency and prices, principally wages and salaries. Therefore we regressed ZC on ZE and the variables that determine labor costs. The effective rate of protection was included on the theory that it measures foreign competitive pressure. The results are as follows:

Dependent Variable: ZC

Independent	β	t - statistic
ZE.	-.94	6.93
WPW67US	.103	1.19
NPW67US	.160	1.85
WNP67US	-.0667	.84
EFT	-.132	1.10
Adjusted R^2	.576	

The only variable with the wrong sign is WNP67US (salaries of U.S. nonproduction workers), and it is insignificant. The *t* statistics are not impressive. Efficiency (ZE) captures much of the variance in ZC, and once again we are forced to conclude that ZE may contain cost as well as purely efficiency differences.

We therefore attempted to explain cost differences using determinants of efficiency and cost directly. The results are as follows:

Dependent Variable: ZC

Independent	β	t - statistic
US468	-.17	1.10
WPW67US	-.173	1.42
NPW67US	-.009	.08
WNP67US	-.181	1.54
MESU	.463	3.07
CDRU	.009	.07
EFT	.382	3.28
SSI	-.097	.85
FSE	-.337	2.72
Adjusted R^2	.36368	

The regression is interesting because of the large number of wrong signs. Because of the lack of significance of all but MESU, EFT, and FSE, conclusions are tentative. But the first four negative signs do suggest the hypothesis that when rents are generated by a combination of tariffs and reasonably low costs, production and nonproduction workers share in the rents. In other words, wages and salaries may not be an exogenous datum for the industry, but an absorber of rents.

PRICE-COST MARGINS

Price-cost margins are rather poorly explained. The price-cost margin, it will be recalled, is value added minus payroll, over shipments. Thus

$$\frac{PCMC}{PCMU} = \frac{\frac{VAC-PC}{SC}}{\frac{VAU-PU}{SU}} = \frac{\frac{VAC}{SC}(1 - \frac{PC}{VAC})}{\frac{VAU}{SU}(1 - \frac{PU}{VAU})}$$

Therefore, as a rough approximation, the price cost margin is determined by relative value added over shipments and relative labor intensity. In the regressions, only relative labor intensities were significant, and that is the result of labor intensity being a component of the variables as shown above.

Value added over shipments is determined by a host of unobserved factors, and there is no hope of explaining this variable directly. However, the relative value added over shipments should be susceptible of some explanations. But, not even the effective tariff is a significant explanatory factor. Nor is either U.S. or Canadian concentration.

CANADIAN CONCENTRATION

Canadian 4 firm concentration follows the U.S. pattern as the regressions show, but there are other interesting connections. The following regression is of some interest.

Dependent Variable: C468

Independent	β	t-s
MESC	.56	7.2
US468	.42	5.4
FSE	-.117	1.85
CDRC	.23	3.7
Adjusted R^2	.74557	

In other regressions, the foreign ownership variable (FSE) is knocked out by a combination of the dummies for consumer-producer and convenience-nonconvenience. This is true in spite of the low correlation between FSE and either of the dummies singly. In this equation, FSE is acting as a proxy for product characteristics. As we shall see later the convenience-nonconvenience and consumer-producer variables explain some of the variation in foreign investment. Since foreign investment is greatest in consumer goods and, within that class, greatest within nonconvenience goods, the negative sign here indicates that concentration is higher in producer goods, and in consumer convenience goods. Foreign ownership might exert a positive influence if U.S. firms had more capital available for merger, but this effect is not confirmed by the data. Both the dummies, if included, are statistically significant. What the dummies say is that Canadian concentration is higher within producer goods and, within consumer goods, it is higher for convenience goods (see the Appendix).

If the advertising-to-sales ratio is included, it is relatively insignificant and negative; but the coefficient for convenience goods rises. As we know, these two variables are highly positively correlated. If the effective rate of protection is included, it is marginal with respect to significance and has a negative impact. This of course is exactly what one would expect in a differentiated-product industry. A higher tariff protects the small-share products and firms that would otherwise be knocked out by U.S. competition.

FOREIGN TRADE FLOWS

Two results emerged from some limited attempts to explain foreign trade flows. The strongest determinant of imports is foreign ownership, and the sign is positive the result of trades within multinational companies. The other statistically significant determinant is product differentiation, which is captured by advertising, or by the combination of consumer-producer, and convenience-nonconvenience dummies mentioned above. In the latter case, consumer goods are imported more, and, within consumer goods, convenience goods are imported less; neither of these results is surprising. The regional dummy is also significant as an explanatory variable.

The effective rate of protection has a negative sign and an economically noticeable impact, but it tended not to be statistically significant, in part because we persisted in including the nominal tariff as well. It is perhaps worth noting that the nominal tariff is reasonably highly correlated with the consumer-producer dummy (nominal tariffs are higher on consumer goods). It is also interesting that the advertising-to-sales ratio (ADI) is positively correlated with the nominal tariff and has a zero correlation with the effective tariff.

The fact that the standard statistics that measure efficiency or scale appear to have virtually no explanatory power at all rather strongly suggests that imports, at least, have more to do with product differentiation, and special relations between foreign and domestic companies, than with relative cost differences directly. Or to put it another way, if one pretends that industries produce homogeneous products, the results are incomprehensible.

Sample Regression

Dependent variable: IMP

Independent	β	t
CDRC	.032	.25
EFT	-.18	.92
NOT	.027	.15
FSE	.242	1.89
CN468	.092	.69
CONO	-.557	3.08
CNPR	.327	1.82

Adjusted R^2 = .014899

A short summary would be that we don't know much about trade flows.

THE RELATION BETWEEN VALUE ADDED PER WORKER (RPR) AND PRICE-COST MARGIN (PCM)

The simple correlation between RPR67 and PCMC/PCMU is .6644. That by itself suggests that much of the difference between the two countries' value added per worker is attributable to what we are calling the price-cost margin. However, the price-cost margin is a faulty measure in one important respect. There is no deduction from value added for capital costs. Therefore, when we attribute much of the difference in value added per worker to price-cost margins, we are really attributing them to margins and capital costs.

With those comments in the background, I report the following simple regression, an attempt to explain value added per worker in terms of the relative costs and the tariffs.

Dependent variable: RPR67

Independent	β	t
ZC	.432	7.68
NOT	-.88	3.09
EFT	-.17	1.39

Adjusted R^2 = .512

The nominal tariff is included because of its possible direct effect on prices. The effective rate of protection is included because it affects the incentives for cost efficiency.

FOREIGN INVESTMENT (FSE)

Since foreign investment in Canadian industry is a matter of some concern to Canadians, we therefore looked into its determinants. While foreign investment is not easy to predict, we found the following factors to be significant. Foreign investment is higher in consumer goods, and, within that category, it is lower in convenience goods. Foreign investment is positively related to Canadian efficiency. The regression reported below seems to suggest that it is positively related to costs and negatively to the nominal tariff. However, since costs were computed from the price-cost margin and the nominal tariff, it is probable that foreign investment actually responds positively to the tariff.

It should be said that there is a great deal of missing data for foreign investment. For this study, we assumed that the missing observations were small and therefore not an unbiased sample. The values of the missing observations were set to zero. This is not ideal, but it is better than eliminating the sample of industries with small foreign investment.

Dependent Variable: FSE

Independent	β	t
CNPR	.33	2.24
ZE	.37	1.62
ZC	.69	3.56
EFT	-.09	.42
MOT	-.47	2.49
CONO	-.36	2.38

Adjusted R^2 = .20767

Degrees of Freedom = 63

The advertising-to-sales ratio (ADI) is significant if one excludes CNPR and CONO. One assumes that the dummy variables capture various aspects of product differentiation and differences in product characteristics better than does ADI.

SMALL AND LARGE ESTABLISHMENTS

The theory outlined earlier suggests that the impact of the tariff and of foreign competition from the United States may be quite different for small and large establishments in Canada. We therefore computed the relative value added per worker for Canadian and U.S. establishments above and below U.S. minimum efficient scale (MESU). The results are rather striking.

Dependent Variable: Ratio of Value Added Per Worker (RPAL)

Small Establishments			Large Establishments		
Independent	β	t	Independent	β	t
ADI	-.18	1.34	LAB2U	-.17	1.24
IMPC	.06	.50	EFT	-.32	2.46
EFT	-.01	.13	MESC	.007	.04
MESU	-.22	.52	MESU	-.117	.75
CDRU	-.24	1.89	CDRU	.374	2.70
Q^q	.40	3.10	Q^q	.201	1.45
			ADI	-.04	.32
Adjusted R^2 = .1656			Adjusted R^2 = .38		

For the large establishments, by far the most important factors are the effective rate of protection (EFT) and the U.S. economies of scale (CDRU). Labor and personnel costs (Q) also appear to be important. Moreover the R^2 is higher than that attainable for either the small firms or the overall ratio of value added per worker in the two countries. The tariff has a negative sign. This is reasonable if you interpret the ratio of value added as a measure of efficiency, although, as I mentioned before, there are reasons to worry about this assumption. There are really conflicting forces at work here.

In terms of our previous notation,

$$\frac{V_c}{V_u} = \frac{w_c + m_c e_c}{w_u + m_u e_u}$$

where V is value added per worker, w is wages, m is margin, and e is labor productivity. When the effective rate of protection rises, products that were previously imported will be produced in Canadian plants, some of them large. The ratio e_c/e_u will fall. That would tend to make V_c/V_u fall. On the other hand, Canadian margins could rise relative to the United States, producing an opposite influence. Apparently, what the regression tells us is that on balance, the negative productivity effect overrides the margin effect.

By contrast, tariffs have little effect on the smaller firms; and with the small firms U.S. economies of scale have a negative impact. The reason is that large economies of scale will cut off the really small Canadian firms and establishments, leaving the larger small firms, which are more efficient. The tariff should have the same effect, but appears not to. By far the most important determinant of small-firm relative efficiency is labor costs. Note that the predictive power of the equation is lower for small firms, but that is to be expected: the small establishments in Canada are quite likely to have a different composition of goods and firms from that in the United States, because the tariff and scale economies tend to truncate the Canadian distribution.

The interesting new feature is the positive sign on CDRC, capturing the returns to scale in the Canadian industry. Because of the way CDRU is computed, it captures the efficiency of small U.S. establishments relative to the large. That would correspond to medium and large Canadian plants. Therefore as CDRU rises, RPAL rises. But as it rises, small Canadian firms are removed from the distribution and RPAS falls. On the other hand, CDRC measures economies of scale in Canada. Therefore, the larger it is the more efficient are small Canadian firms and RPAS rises.

The following regression does somewhat better for the small firms.

Dependent Variable: Ratio of Value Added

per Worker in Small Firms (RPAS)

Independent	β	t
CNPR	-.008	.04
IMP	.006	.04
EFT	-.113	.75
MESU	-.227	1.72
CDRC	.181	1.43
CDRU	-.2036	1.56
Q	.3046	2.91
CONO	.087	1.49

Adjusted $R^2 = 0.21034$

An interesting version of the equation explaining relative efficiency in large establishments is shown below. The capital intensity measure, correlated with minimum efficient scale, is statistically and economically significant.

Dependent Variable: Value Added per Worker

(CAN/US) in Large Firms

Independent	β	t
CNPR	-.13	.79
Q^9	.298	2.51
CDRC	.40	3.3
EFT	-.35	2.55
LAB2CU	.30	2.48
CONO	-.06	.39

Adjusted R^2 = .42740

The relative capital intensity variable (LAB2CU) has a positive sign, indicating that for large firms, part of the Canadian value added, when it is high, is attributable to capital costs. These are costs that should be measured if efficiency is to be assessed with greater accuracy than is possible with only labor-input data.

EXPLAINING CANADIAN EFFICIENCY

The principal difference between the Canadian and U.S. economies is scale. That difference, in terms of the regressions, will be picked up by the constant term. The R^2 reported for each regression measured the explained deviations from the mean. But that is only part of what we are interested in. We should also like to know what is the explained deviation from the U.S. industry. This makes an enormous difference in how the results are interpreted.

Let us consider the variable RPR, the ratio of value added per worker in Canada over the same figure for the United States. We have a regression of the form

$$y_i = c + \beta x_i$$

where y = RPR, c is a constant, and x are other explaining variables. Let $\hat{y}_i$ be the predicted value of y_i. Let $\bar{y}$ be the mean of y and σy^2 be its variance.

We can ask how much of the deviation of y_i from unity is explained by the regression. To answer this question, we would compute

$$M = \frac{\sum(\hat{y}_i - 1)^2}{\sum(y_i - 1)^2} = \frac{\sum_i(\hat{y}_i - \bar{y})^2 + N(\bar{y}-1)^2}{\sum_i(y_i - \bar{y})^2 + N(\bar{y}-1)^2}$$

Here, N is the number of industries in the sample.

The R^2 of the regression is

$$R^2 = \frac{\sum(\hat{y}_i - \bar{y})^2}{\sum(y_i - \bar{y})^2} \quad .$$

Therefore

$$M = \frac{R^2 \sigma y^2 + (\bar{y}-1)^2}{\sigma y^2 + (\bar{y}-1)^2} \quad .$$

M has several properties. If $\bar{y} = 1$, $M = R^2$. If σy^2 is small, M approaches 1, meaning all the difference is explained by the means. If $R^2 = 1$, then $M = 1$ because we have explained the deviation from the means and the constant captures the mean itself. Now back to RPR. It has a mean of .7917 and a variance of .001572. Therefore

$$M = .629 + .371 R^2$$

This means that 62.9 per cent of the difference between RPR and one (or the difference between Canada and the United States) is attributable to differences in the means. If the R^2 for a regression is 0.25, a typical figure, then

$$M = .722.$$

It is of course true that the causes of the differences in the means, or the deviation of the mean of RPR from one are not identified. For example, we have not disentangled the effects of market size and differences in managerial competence. Nevertheless, it is useful to know that much of the difference is systematic across industries and that it is likely to have market size as an important explanatory component.

I will not report the value of M for each of the ratio variables used in a regression. What I have done is to compute for each ratio variable, the coefficient in the relation

$$M = a + bR^2$$

The coefficients are

$$a = \frac{6y^2}{6y^2 + (\bar{y}-1)^2} \quad ,$$

and

$$b = \frac{(\bar{y}-1)^2}{6y^2 + (\bar{y}-1)^2} = 1-a \quad .$$

Then it is sufficient to report b, the fraction of the variance from 1, attributable to the mean. The results are reported in Table 11.9.

Table 11.9

Variable	Fraction of Difference Attributable to the Mean
RPR	.629
PCMC/PCMU	.192
FSE*	.538
LAB167	.248
VPE67US	.027
VRT67US	.0345
CUS468	.40
ROICU	.282
MESCU	.518

* - For this variable, the norm is taken to be zero, not one.

CONCLUDING REMARKS

Much more remains to be done with this data and these problems. The equations explaining trade flows, foreign ownership and various measures of relative efficiency need to be embedded in a full model of the structural and performance variables, and then subjected to consistent two stage least squares estimates. To achieve that goal, the missing data, which we have found in subsequent work, to be related to the underlying observations, have to be estimated. Our hope is that the estimates reported here are refinements of them stand up to consistent procedures.

Apart from estimation problems, the Canadian manufacturing sector exhibits some rather clear differences from its American counterpart. The evidence suggests that Canadian industries are a truncated version of the U.S. counterpart, with the truncation occurring among products and firms with small shares. Value added per worker is lower in Canada, this being the result of some combination of differences in labor productivity (i.e. economies of scale) and rates of return to labor and capital. Tariffs appear to be low enough to constrain the rates of return in Canadian industry, which generally is highly concentrated and hence likely to be very profitable in the absence of foreign competition.

Trade flows especially imports result from product differentiation and the aforementioned truncation of the Canadian industry, and also from transactions between multinational companies.

For certain variables, the Canadian-U.S. differences are explained by factors which affect all industries, principally scale of the market. The ratio of value added per worker in the two countries is the clearest case of this.

1. The bifurcation of the market is not simply due to tariffs. It results also a host of other non-tariff barriers and distortions that affect relative prices of inputs and outputs, the incentives (tax for example) that determine manufacturing location, imperfections in the capital market, and so on.

2. The greater output diversity of comparable size Canadian plants has been shown statistically in Caves, (1975), Chapter 5.

3. See Oksanen and Williams, (June 1976).

4. The proof of this is as follows.

$$\rho^2 = m^T\Omega^{-1}m = \frac{1}{4}\, y^T\Omega^{-1}y \, .$$

Now

$$\Omega = V(I + \tfrac{1}{4}V^{-1}yy^T)$$

so that Ω^{-1} is

$$\Omega^{-1} = (I + \tfrac{1}{4}V^{-1}yy^T)^{-1}V^{-1}$$

$$= (I - \tfrac{1}{4}V^{-1}yy^T + \tfrac{1}{16}\, V^{-1}yy^TV^{-1}yy^T - \ldots)V^{-1} \, .$$

Therefore $y^T\Omega^{-1}y$ equals

$$z - \tfrac{1}{4}z + \tfrac{1}{16}z^2 - \ldots \quad = \frac{4z}{4+z} \quad ,$$

where $z = y^TV^{-1}y$. Therefore

$$\rho^2 = \frac{z}{4+z} \, ,$$

as asserted.

5. There is a non-trivial problem estimating V^u and V^c. The maximum likelihood approach is described in another section.

6. US rates of return were inflated because of the Vietnam war boom. The power of ROI might not hold for other years.

7. The dividing line between the Canadian and American means is 7.41.

8. A summary of the regressions is given in Table 8 at the end of this section. In the text, we report representative equations.

9. Q is a measure of relative labor costs. Formally, it is the ratio of

$$WPW(2,000)(1 - NPW) \quad WNP \;\dot{}\; NPW$$

in Canada over the same constructed variable for the USA. It therefore contains differences in wages and salaries, and differences in the ratio of production to non-production workers.

Caves, R., Diversification, Foreign Investment and Scale in North American Manufacturing Industries (Ottawa: Information Canada (1975).

Oksanen and Williams International Cost Differences: A Comparison of Canadian and United States Manufacturing Industries, (June 1976).

Appendix A

GENERAL DATA BASE

The principal data base used for this project contains observations on two populations--manufacturing industries, and large enterprises engaged principally in manufacturing. The variables in the industrial data base include many that pertain to each Canadian industry's counterpart in the United States, for over 90 percent of our Canadian industries can be matched to industries or aggregates of industries defined in the United States standard industrial classification. The variables in the company data base include income-statement and balance-sheet data for the firms themselves but also observations on the industries in which they operate. We classified these companies to their principal industries and recorded for each enterprise all data for its principal industry. But we also secured information on the distribution of each enterprise's output among manufacturing industries, and used this information to construct weighted-average observations on the characteristics of industries in which the firms operate.

A.1. Selection of Samples

As is often the case with research in industrial organization, the underlying populations and the data available on them precluded any random sampling. Our populations are thus the result of eliminating unsatisfactory entities from those on which data are available, rather than of sampling from the satisfactory ones.

Sample of industries

The classification of industries used in our analysis is the Canadian standard industrial classification (SIC) prior to its revision in 1970. It is unfortunate that data were available under the new classification for too brief

a period to permit its use, because it makes a number of desirable rearrangements and disaggregations of categories from the previous classification, and also is easier to match to the United States SIC. The pre-1970 classification was in use between 1960 and 1970 with few changes. From it we selected 123 of its 140 three-digit categories, deleting only those covering residual groups of products not included elsewhere. It must be stressed that some of the industries included (for example, 315, miscellaneous machinery and equipment manufacturers) cannot by any stretch of the imagination be described as containing only competitors in a single market.

A subsample of these industries was matched to industries in the United States standard industrial classification (the version that preceded the revision of 1972). Our matching process closely followed that undertaken by the Department of Industry, Trade and Commerce in connection with their series of volumes Comparative Tables of Principal Statistics and Ratios for Selected Manufacturing Industries, Canada and United States. We excluded a few industries matched by the department through the aggregation of industries in both the United States and Canadian classifications, because the resulting aggregate seemed too heterogeneous. For some of the matched industries a single category in the Canadian SIC corresponded to a four-digit industry in the U.S. SIC. More often it was necessary to aggregate data for two or more U.S. four-digit industries to match the Canadian industry. Of our 123 Canadian industries a maximum of 114 are matched to U.S. data.

The Canadian and United States classifications also had to be matched for another purpose--to permit aggregation to the industry level of data on the output diversity of Canadian companies secured from Dun & Bradstreet

records and described below). The Dun & Bradstreet data employ the current (post-1972) United States SIC; it was matched to the pre-1960 Canadian SIC using information provided by the Department of Industry, Trade and Commerce in connection with the 1972 edition of Comparative Tables, and also the Canadian standard industrial classification manuals. Because of difficulties in matching classifications and also because of gaps in the underlying data on diversity, a maximum of 80 Canadian industries could be matched. In addition, for five pairs of Canadian industries these data had to be aggregated to an amalgam of two Canadian SIC categories and the common value of each variable assigned to both.

A final problem of matching industry data lay in the aggregations performed by Statistics Canada in reporting financial information on companies classified to SIC industries. Of our 123 industries, 62 are shown in Corporate Financial Statistics (Catalogue No. 61-207) only as aggregates with other industries. We had to assume that data for the aggregates are representative for their components.

Table A.1 lists the 123 industries included in our data base and presents some of the data mentioned above on matching and aggregation.

Sample of Companies

Our principal source of data on large companies was a tape provided by the Financial Research Institute (FRI) containing annual income-statement and balance-sheet data on 337 companies for the years 1961-1974 (in some cases, a shorter period). The FRI tape includes many companies not based in manufacturing industries or not primarily engaged in manufacturing. Several sources of information were available for determining which companies were primarily engaged in manufacturing, and to which primary manufacturing industry they

should be classified. We secured the industrial classifications assigned to these companies by Statistics Canada and also by Dun & Bradstreet. These often agree, though not always, and their classification of firms as holding companies provides no useful information about their primary industries. We therefore utilized a third source as well--a tape secured from Dun & Bradstreet showing the activities of the manufacturing establishments of these and other companies. The D&B tape and the assumptions required to process data from it are described in section 4.2 of our report. The assignment of a primary industry when these sources disagree required the exercise of judgment. Because our determination of the distribution of a firm's outputs from the D&B tape is only approximate and because Statistics Canada presumably uses accurate raw data, we tended to believe Statistics Canada when a conflict had to be resolved.

From the 337 FRI companies we selected 125 that we felt could be safely classified as primarily engaged in manufacturing, and for which a primary industry can be selected with some confidence. The latter constraint was not very influential, because in any case we planned to represent each company by a weighted-average of the industries in which it participates. Those weighted-average variables were calculated from a vector of the proportions of each company's manufacturing employment assigned to each U.S. four-digit industry in which it participates. Each U.S. four-digit industry was then assigned to the Canadian three-digit industry that primarily contains the same economic activity, and the industry variables from our industry data base weighted to represent the industries in which the firm participates. Not every Canadian industry is included in our data base, and observations are missing on some variables for the industries that are included. Observations

missing for either of these reasons were dropped when weighted-average industry variables were calculated for our companies, so that the companies are sometimes represented by less than the full range of industries in which they participate.

The FRI sample of companies has certain peculiarities. Not every company is an ultimate parent enterprise--i.e., some are subsidiaries of other domestic companies. Some multinational companies' Canadian subsidiaries are included, though the FRI population of companies is in effect biased against multinational subsidiaries because it includes only public companies that publish separate income statements and balance sheets. Our sample includes at least 26 that are subsidiaries of foreign enterprises. We maintained a dummy variable in the data base to distinguish them, but we did not distinguish large companies that are subsidiaries of Canadian owned enterprises. Table A.2 lists enterprises from the FRI tape included in our sample of manufacturing companies and shows their nationality and assigned primary industry.

A.2. Definitions of Variables and Sources of Data

We now proceed to define the variables used in this study and indicate their sources. Four of those sources are tapes that we can usefully describe at the outset. These tape sources were not included in the data base in their primary form; rather, variables were taken or calculated from them and placed in the research data base.

1. Financial Research Institute tape includes observations on a maximum of 92 income-statement and balance-sheet variables for each of 337 companies over a period at the maximum of 1961-1974.

2. Statistics Canada tape contains the Census of Manufactures Principal

Statistics for the years 1961-1971, data by industry (and by province, although provincial detail were not utilized in this project) and year on 33 variables.

3. Dun & Bradstreet tape contains all of Dun & Bradstreet's records for establishments in Canada (excluding branches of enterprises located in foreign countries) that are primarily engaged in manufacturing and employ 50 or more. The records number 0000. Usable data on these records are confined to the activities carried on in each establishment, described by four-digit categories of the U.S. SIC (maximum of six of these, ranked in order of importance); number of employees at the location; and an identification number that allows the ownership of the establishment to be traced to the next higher level of the company's organization. By using these numbers we assembled the D&B establishment records into 2167 companies.

4. Elliott Research tape contains data on advertising expenditures in Canada for 1,324 companies operating in the country in 1972. The data are broken down by media (radio, network television, spot television, magazines, and other print media--largely newspapers) and include only media costs and not the preparation cost of the advertisements. These data were aggregated to the Canadian industries in our sample by matching them manually to company names on the Dun & Bradstreet tape and using the determination of each company's primary industry from that source.

There follows a two-part alphabetical listing of the variables in the research data base--first, those pertaining to industries, then those describing large companies. For each variable we provide an exact definition and source plus comments on any special aspects of or problems with its construction.

Industry variables

ADI Ratio of reported total advertising costs (both internal and external to the firm) to the value of industry shipments, 1965. The source follows the SIC classification of industries but includes only selected industries. Although the text does not state explicitly, it is clear that the omitted industries do very little advertising at the manufacturer level. For these industries a value of 0.1 percent was recorded, rather than show them as missing observations. Source: Dominion Bureau of Statistics, Merchandising and Services Division, *Advertising Expenditures in Canada, 1965,* Catalogue No. 63-216 (Ottawa: Information Canada, 1968), Table 19.

ATS Total assets divided by total income (sales, rental, investment), 1969. Source: Statistics Canada, *Corporation Financial Statistics, 1969*, Catalogue No. 61-207 (Ottawa: Information Canada, 1972), Table 2. Some industries are grouped together; the common average value is then assigned to each component industry in our data base. Of 123 industries, 62 are so grouped.

BIGE Proportion of industry value added in establishments larger than the establishment that accounts for the 50th percentile of employment in the U.S. counterpart industry. This median-size U.S. plant was determined by deleting from the U.S. industry plants employing 1 - 10, counting down the employment size-classes from the largest to isolate the one containing the 50th percentile of employment, and assuming a rectangular distribution of plants by employment in that size class. In the Canadian industry, value added per worker was assumed to be the same for all establishments in the size class that contains the estimated size of the U.S. establishment accounting for the 50th percentile of employment. Total value added in the Canadian industry is determined after deleting plants employing 1 - 5, or plants employing 1 - 15 when this is the smallest size-class shown and its average plant employs less than

7 workers. Source: U.S. Bureau of the Census, Census of Manufactures, 1967 (Washington: Government Printing Office, 1972), Vol. I, Table 3; Statistics Canada, Manufacturing Industries of Canada: Type of Organization and Size of Establishments, 1969, Catalogue No. 31-210 (Ottawa: Information Canada, 1973), Table 9. The same year could not be used for both countries because the U.S. figures are available only for census years, the Canadian ones not before 1969.

C465 Percentage of shipments accounted for by the largest four enterprises 1965, constructed by classifying each establishment to its primary industry and treating as a single enterprise all establishments found to be under common control. For five industries disclosure rules precluded the publication of a figure by Statistics Canada, but one can be closely approximated. For ten industries the concentration ratio for the three-digit industry is approximated by a shipments-weighted average of some or all of its four-digit components. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 2.

C468 Percentage of shipments accounted for by the largest four enterprises, 1968. For method of construction, see C465. The series is taken from the same source as C465. However, the same series in a later publication of Statistics Canada gives slightly revised figures for many industries, and these figures were used where they differ from the earlier one. This later source is Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1970, Catalogue No. 31-402 (Ottawa: Information Canada, 1975), Table 2.

C470 Percentage of shipments accounted for by the largest four enterprises, 1970. For method of construction, see C465. Because this variable was compiled on the new (1970) standard industrial classification, it is not available for every industry. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1970, Catalogue No. 31-402 (Ottawa: Information Canada, 1975), Table 2.

C865 Percentage of shipments accounted for by the largest eight enterprises, 1965. For method of construction see C465. For five industries we entered an approximate figure where disclosure rules prohibited publication of the true figure by Statistics Canada, but a close estimate was possible. For ten industries, the concentration ratio for the three-digit industry is approximated by a shipments-weighted average of some or all of its four-digit components. Source: same as C465.

C868 Percentage of shipments accounted for by the largest eight enterprises, 1968. For method of construction and source see C468. An approximate figure was entered for six industries where disclosure rules prohibited publication of the true figure by Statistics Canada, but a close approximation was possible.

C870 Percentage of shipments accounted for by the largest eight enterprises, 1970. For method of construction and source see C470.

CDRC Cost disadvantage ratio: value added per worker in the smallest establishments accounting for (approximately) half of employment in the industry divided by value added per worker in the largest establishments accounting for the other half, 1969. The smallest size class of establishments (1 - 15 employees) was dropped whenever its average size was less than seven. No observation was recorded when either the large or small establishment groups accounted for less than 20 percent of industry employment. Source: Statistics Canada, Manufacturing Industries of Canada: Type of Organization and Size of Establishments, Catalogue No. 31-210 (Ottawa: Information Canada, 1973), Table 9.

CDRU Cost disadvantage ratio in the United States counterpart industry. CDRU was constructed like CDRC, except that the smallest size class dropped before undertaking the calculation was 1 - 10 employees. Source: U.S. Bureau of the Census, 1967 Census of Manufactures (Washington: Government Printing Office, 1971), Vol. I, Chapter 2, Table 3.

CECT Energy cost divided by total variable cost 1971, minus energy cost divided by total variable cost 1961; expressed as a ratio to energy cost divided by total variable cost 1961. Source: Statistics Canada tape.

CNPR Dummy variable, equals 1 if the industry is judged to manufacture primarily consumer's goods, zero if it manufactures primarily producers' goods. CNPR is contructed with reference to the input-output table (see CONS) but takes account of the primary orientation of the industry's marketing strategy (e.g. rubber tires and tubes are classified as a consumers'-good industry although a large fraction of shipments are made to producers).

CONO Dummy variable, equals 1 if the consumer-goods industry is judged to sell a "convenience good," zero otherwise. The variable is constructed judgmentally on principles discussed by Michael E. Porter, *Interbrand Choice, Strategy, and Bilateral Market Power* (Cambridge: Harvard University Press, 1976).

CONS Consumers' expenditures on products classified to the industry (including imported products) divided by total domestic shipments (including exports) plus imports, 1966. Source: Statistics Canada,

The Input-Output Structure of the Canadian Economy 1961-66, Catalogue No. 15-501E (Ottawa: Information Canada, 1976), Tables 36, 42. The medium-level aggregation is the finest shown in this document, so that individual SIC industries were often assigned average values for larger input-output sectors.

CVC Coefficient of variation of shares of the eight largest enterprises, 1968. For ten industries, the coefficient for the three-digit industry is approximated by a shipments-weighted average of some or all of its four-digit components. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 5.

CVPE Difference between value added per establishment in 1971 and value added per establishment in 1961 divided by value added per establishment in 1961. Source: Statistics Canada tape.

DCI Concentric measure of diversification, weighted average of all enterprises classified to the industry. For source and details of construction see Chapter 4, section 4.2.

DE3I Fraction of employees in manufacturing establishments engaged in activities classified to the enterprise's principal three-digit industry (U.S. Standard Industrial Classification), weighted average of all enterprises classified to the industry. For sources and details of construction see Chapter 4, section 4.2.

DE4I Fraction of employees in manufacturing establishments engaged in activities classified to the enterprise's principal four-digit industry (U.S. Standard Industrial Classification), weighted average of all enterprises classified to the industry. For sources and details of construction see Chapter 4, section 4.2.

DHI Herfindahl measure of diversification, weighted average of all enterprises classified to the industry. For source and details of construction see Chapter 4, section 4.2.

DWI Weighted measure of diversification, weighted average of all enterprises classified to the industry. For source and details of construction see Chapter 4, section 4.2.

ECA67 Number of employees, 1967. Source: Department of Industry, Trade and Commerce, Comparative Tables of Principal Statistics and Ratios for Selected Manufacturing Industries, Canada and United States, 1967, 1963 and 1958 (Ottawa: Department of Industry, Trade and Commerce, 1971).

EFT Effective rate of protection, 1963, constructed on the assumption that unspecified inputs carry average nominal tariffs of 5 percent. Most industries in the source directly match the 3-digit industries in our data base, though for one (381) a shipments-weighted average was taken of four-digit products. Because the auto pact was in effect during the years to which most of our data pertain, the tariff rate for this industry was set equal to zero. Source: James R. Melvin and Bruce W. Wilkinson, Effective Protection in the Canadian Economy, Special Study No. 9 (Ottawa; Economic Council of Canada, 1968), Table 1.

EUS67 Number of employees in manufacturing establishments classified to the United States counterpart industry, 1967. For source see ECA67.

EXP Net exports (i.e. net of re-exports) divided by value of shipments, 1961. Source: Dominion Bureau of Statistics, Input-Output Research and Development Staff, The Input-Output Structure of the Canadian Economy, 1961, Catalogue No. 15-501 (Ottawa: Information Canada, 1969), Vol. II, Table 13. Figures for the motor vehicles industry (323) and the motor-vehicle parts and accessories industry for the years 1966-68 were taken from Carl E. Beigie, The Canada-U.S. Automotive Agreement: An Evaluation (Montreal and Washington: Canadian-American Committee, 1970), various tables. Most industries in the finest disaggregation of the input-output table match three-digit SIC categories, but in a few cases it was necessary either to aggregate finer subcategories or to assume that figures for subcategories are the same as for the broader category into which they are aggregated.

EXPU Exports divided by value of shipments, U.S. counterpart industry, 1961. Source: U.S. Bureau of the Census, Commodity Exports and Imports as Related to Output, 1961 and 1960, Series ES-2, No. 4 (Washington: Government Printing Office, 1963), Table 1C.

FIN Closing inventory of finished goods divided by closing total inventory, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

FSE Value of shipments and other revenue, establishments classified as belonging to enterprises fiften percent or more foreign-controlled, 1969, divided by value of shipments by all establishments in the industry, 1969. For source and methods of construction see FRN.

GNE Slope coefficient from regression of logarithm of total number of establishments on time (1961 = 1, 1962 = 2, ... , 1971 = 11). Source: Statistics Canada tape.

GSI Slope coefficient from regression of logarithm of total value of shipments and other revenue on time (1961 = 1, 1962 = 2, ... , 1971 = 11). Source: Statistics Canada tape.

HFL Herfindahl measure of seller concentration. The variable is available for 1965, 1968, and 1970 (HFL65, HFL68, and HFL70). For source see C465 and C470.

IMP Imports divided by value of shipments, 1961. For source and method of construction see EXP.

IMPU Imports divided by value of shipments, U.S. counterpart industry, 1961. For source see EXPU.

LABI Ratio of payroll to value added, Canadian industry, divided by ratio of payroll to value added in the counterpart U.S. industry. LABI was claculated for 1958, 1963, and 1967 (LAB158, LAB163, AND LAB167). For source see ECA67.

LAB2C Total number of employees divided by total assets, 1967. Some industries were omitted because of the aggregation of industries beyond the three-digit level in the published corporate financial statistics. Source: numerator--see ECA67; denominator--Statistics Canada, Corporate Financial Statistics, 1967, Catalogue No. 61-207 (Ottawa: Information Canada, 1970), Table 2. Data on the companies classified to an industry include their assets in the form of plants classified to other industries, and omit assets in the form of primary establishments belonging to companies in other industries.

LAB2U Total number of employees in the U.S. counterpart industry divided by its total assets, 1967. Source: numerator--U.S. Bureau of the Census, Census of Manufactures. Vol. I. Summary Statistics (Washington: Government Printing Office, 1971), Table 3; denominator--U.S. Bureau of the Census, Enterprise Statistics, 1967 (Washington: Government Printing Office, 1971), Vol. 3, Table 1.

MDPC Number of manufacturing establishments owned by multi-industry enterprises classified to the industry but themselves classified to other industries, 1968. For source see MIEC.

MDPU Number of manufacturing establishments owned by multi-industry enterprises classified to the industry but themselves classified to other industries, U.S. counterpart industry, 1967. For source see MIEU.

MESC Shipments by the estimated minimum-efficient-scale establishment divided by industry shipments, 1969. The minimum-efficient-scale establishment is estimated as the mean size of the largest establishments accounting for (approximately) half of the industry's employment; the procedure for determining this half was the same as that used for CDRC. For source see CDRC.

MESU Shipments by the estimated minimum-efficient-scale establishment divided by industry shipments, U.S. counterpart industry, 1967. For method of construction and source see MESC and CDRU

MIEC Number of multi-industry enterprises (owning plants classified to more than one industry) 1968. This and related variables are available only for selected industries, and it was necessary to apply average values for aggregated industries to individual sectors in our data base. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining, and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 7.

MIEU Number of multi-industry enterprises (owning plants classified to more than one industry), United States counterpart industry, 1967. Source: U.S. Bureau of the Census, Enterprise Statistics, 1967 (Washington: Government Printing Office, 1972), Chapter 2, Table 1.

MPPC Number of manufacturing establishments classified as primary to the industry and owned by multi-industry enterprises classified to the industry, 1968. For source see MIEC.

MPPU Number of manufacturing establishments classified as primary to the industry and owned by multi-industry enterprises classified to the industry, U.S. counterpart industry, 1967. For source see MIEU.

NCA Number of establishments classified to the industry. NCA was tabulated for 1958, 1963, and 1967 (NCA58, NCA63, and NCA67). For source see ECA67.

NEMC Mean proportional annual change in number of establishments classified to the industry, 1961-1971. Source: Statistics Canada tape.

NENT Number of companies classified to the industry, 1968. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 1.

NOT Nominal rate of tariff protection, 1963. For source and methods of construction see EFT.

NPC Employment-weighted average number of manufacturing establishments belonging to enterprises classified to the industry. Source: Dun & Bradstreet tape (for details see Chapter 4).

NPU Number of manufacturing establishments owned by enterprises classified to the industry divided by number of enterprises classified to the industry, United States counterpart industry, 1967. Source: U.S. Bureau of the Census, 1967 Enterprise Statistics (Washington: Government Printing Office, 1972), Part 1, Table 2-1.

NPW Nonproduction workers divided by total employees, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

NPWUS Number of nonproduction workers divided by total number of employees, manufacturing establishments classified to the U.S. counterpart industry, 1967. For source see ECA67.

NSI Unduplicated number of industries (four-digit classes in the U.S. Standard Industrial Classification) in which each enterprise is active, weighted average of all enterprises classified to the industry. For source and details of construction see Chapter 4, section 4.2.

NUS Number of establishments classified to the United States counterpart industry. NUS was tabulated for 1958, 1963, and 1967 (NUS58, NUS63, and NUS67). For source see ECA67.

OWN One minus ownership specialization ratio (defined as the ratio of value added of the primary establishments of the enterprises classified to the industry to the value added of all establishments classified to the industry). Not infrequently the source gives a range of values rather than a specific number (because of disclosure rules); the value assigned to these industries was the midpoint of the range. No figure at all is given for some industries in which only a tiny fraction of establishments belong to enterprises classified to other industries. In these cases it was assumed that the fraction of value added accounted for by owning enterprises outside the industry is the same as the fraction of the number of establishments so owned (in most cases this rounds to 0.0). Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 8.

OWNU The variable's construction is identical to that of OWN, but it pertains to the United States counterpart industry for 1967. Source: U.S. Bureau of the Census, 1967 Enterprise Statistics (Washington: Government Printing Office, 1972), Part 1, Table 1-2.

PCMC The difference between total value added and payrolls, divided by value of shipments, 1967. For source see ECA67.

PCMU The difference between total value added and payrolls, United States counterpart industry, divided by value of shipments, 1967. For source see ECA67.

PLCN Number of establishments per enterprise for the largest four enterprises in the industry, divided by number of establishments per enterprise for all enterprises in the industry, 1968. For source see NENT.

PLSZ Value of shipments per establishment for establishments belonging to the largest four enterprises, divided by shipments per establishment for all establishments classified to the industry, 1968. For source see NENT.

PRB Working owners and partners divided by number of establishments classified to the industry, averaged over 1961-1971. Source: Statistics Canada tape.

PRMG Percentage of advertising outlays spent on magazine advertising, 1972. Source: Elliott Research tape and Dun & Bradstreet tape. Companies listed by Elliott Research were matched to the companies constructed from establishment records on the Dun & Bradstreet tape and assigned to the base industry deduced for them from the activities of their establishments recorded by Dun & Bradstreet. Companies were then assigned to the Canadian industries in our data base by means of a concordance with the U.S. standard industrial classification; outlays on magazine advertising were then summed and divided by all recorded advertising outlays of companies assigned to the industry.

PRNT Percentage of advertising outlays spent on network television advertising, 1972. For sources and methods of construction see PRMG.

PRNW Percentage of advertising outlays spent on newspaper and other printed media (excluding magazines), 1972. For sources and method of construction see PRMG.

PRRD Percentage of advertising outlays spent on radio, 1972. For sources and methods of construction see PRMG.

PRSP Percentage of advertising outlays spent on local television and TV spot announcements, 1972. For sources and methods of construction see PRMG.

REG Dummy variable equals one where the industry is judged subject to significant regional fragmentation, zero otherwise. Thirty industries were so classified. Source: Department of Consumer and Corporate Affairs, Concentration in the Manufacturing Industries of Canada (Ottawa: Information Canada, 1971), Table A-5.

ROI Net profit (loss) after taxes divided by total equity (common shares, preferred shares, retained earnings, other surplus), averaged over 1968-71. Source: Statistics Canada, Corporation Financial Statistics, 1969, Catalogue No. 61-207 (Ottawa: Information Canada, 1972), Table 2; idem, 1971, Catalogue No. 61-207 (Ottawa: Information Canada, 1974); Tables 2A, 2B. Frequently, industries are grouped together; the common average value is then assigned to each component industry in our data base. Of 123 industries, 62 are so grouped.

ROIU Net rate of return after taxes on stockholders' equity, U.S. counterpart industry, 1968-71. Source: U.S. Treasury Department, Internal Revenue Service, Statistics of Income: Corporations, 1968, 1969, 1970, 1971 (Washington: Government Printing Office, 1971-74), Table 1, cols. 8, 16. The IRS industry classification in use from 1968 is a more aggregated version of the previous (1963) classification. Our Canadian industries were matched first to the 1963 IRS classification, and aggregated categories under the 1968 classification are assumed representative for each of the component Canadian industries matched to them. In a few cases we used a figure for an IRS industry that omits a small amount of activity included in the Canadian industry to which it is matched.

RPAL Value added per worker in Canadian manufacturing establishments larger than the establishment that account for 50th percentile of employment in the U.S. counterpart industry, divided by value added per worker in U.S. establishments larger than this 50th-percentile establishment. The minimum-size plant for inclusion was determined by deleting from the U.S. industry plants employing 1 - 10, counting down the employment size-classes to isolate the one containing the 50th percentile of employment, and assuming a rectangular distribution of plants by employment in that size class. In the Canadian industry, value added per worker was assumed to be the same for all establishments in the size class that contains the estimated size of the U.S. establishment accounting for the 50th percentile of employment. Source: U.S. Bureau of the Census, Census of Manufactures, 1967 (Washington: Government Printing Office, 1971), Vol. I, Chapter 2, Table 3; Statistics Canada, Manufacturing Industries of Canada: Type of Organization and Size of

Establishments, 1969, Catalogue No. 31-210 (Ottawa: Information Canada, 1973), Table 9. The same year could not be used for both countries because the U.S. figures are available only for census years, the Canadian ones not before 1969.

RPAS Value added per worker in Canadian manufacturing establishments smaller than the establishment that accounts for the 50th percentile of employment in the U.S. counterpart industry, divided by value added per worker in U.S. establishments, smaller than this 50th-percentile establishment. For source and method of construction see RPAL. Note that the smallest size-class is exclused from the calculation for both countries: 1 - 10 workers in the United States; in Canada 1 - 5, but 1 - 15 when that is the smallest class shown and its average establishment employs less than 7 workers.

RPR Value added divided by total number of employees in the Canadian industry; expressed as a ratio to value added divided by total number of employees in the United States counterpart industry. RPR was calculated for the years 1958, 1963, and 1967 (RPR58, RPR63, and RPR67). No exchange-rate correction was made, i.e. parity of the U.S. and Canadian dollars was assumed. RPR is available only for industries that could be matched between the U.S. and Canadian SICs (see text of this appendix). Source: Department of Industry, Trade and Commerce, Comparative Tables of Principal Statistics and Ratios for Selected Manufacturing Industries, Canada and United States, 1967 (Ottawa: Department of Industry Trade and Commerce, 1971).

RPRL Value added per employee in large establishments, Canada, 1969, divided by value added per employees in large establishments, United States, 1967. "Large" establishments were defined by dropping the smallest establishments in terms of employment (less than 15 in Canada, less than 10 in the United States) and splitting the remaining size classes of establishments as nearly as possible into the larger and smaller establishments each accounting for half of the balance of the industry's employment. Divergent years were utilized because the data are not published for Canada before 1969, and are available for the U.S. only in Census years. Industries were dropped when less than 20 or more than 80 percent of employment was unavoidably assigned to "large" establishments (because of the limited number of employment size-classes published).

Source: Statistics Canada, Manufacturing Industries of Canada: Type of Organization and Size of Establishments, 1969, Catalogue No. 31-210 (Ottawa: Information Canada, 1973), Table 9; U.S. Bureau of the Census, 1967 Census of Manufactures (Washington: Government Printing Office, 1971), Vol. I, Chapter 2, Table 3.

RPRS Value added per employee in small establishments, Canada, 1969, divided by value added per employee in small establishments, United States, 1967. For source and method of construction see RPRL. "Small" establishments are those neither deleted at the bottom end of the size distribution nor included among "large" establishments in calculating RPRL.

SACI Mean proportional absolute annual change in total value of shipments and other revenue, 1961-1971. Source: Statistics Canada tape.

SIEC Number of single-industry enterprises, 1968, including both single-plant and multiplant enterprises. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining, and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 7.

SIEU Number of single-industry enterprises, 1967, U.S. counterpart industry, including both single-plant and multi-plant enterprises. Source: U.S. Bureau of the Cenus, Enterprise Statistics, 1967 (Washington: Government Printing Office, 1972), Chapter 2, Table 1.

SIIC Number of single-plant companies, 1968. For source see SIEC.

SIPC Number of manufacturing establishments belonging to single-industry enterprises, 1968. For source see SIEC.

SIPU Number of manufacturing establishments belonging to single-industry enterprises, U.S. counterpart industry, 1967. For source see SIEU.

SMCI Mean proportional annual change in total value of shipments and other revenue, 1961-1971. Source: Statistics Canada tape.

SPL One minus enterprise industry specialization ratio (defined as value added by establishments classified to the industry divided by value added by all establishments belonging to enterprises classified to the industry). Not infrequently the source gives a range of values

for the enterprise industry specialization ratio rather than a specific number; in these cases the midpoint of the range was taken as an estimate of SPL. Source: Statistics Canada, Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, 1968, Catalogue No. 31-514 (Ottawa: Information Canada, 1973), Table 7.

SPLU The variable's construction is identical to that of SPL, but pertains to the United States counterpart industry for 1967. Source: U.S. Bureau of the Census, 1967 Enterprise Statistics (Washington: Government Printing Office, 1972), Part 1, Table 2-1.

SSI Standard deviation of total value of shipments and other revenue around its logarithmic regression on time. For source and method of construction see GSI.

TRN Weighted average of rail and truck shipping costs per dollar's worth of product between Cleveland and Chicago. Source: F. M. Scherer et al., The Economics of Multi-Plant Operation: An International Comparisons Study (Cambridge, Mass.: Harvard University Press, 1975), Appendix Table 5.1. Scherer's procedure involved finding a measure of the wholesale value of each U.S. four-digit industry's products per pound of shipping weight, obtaining truck and rail commodity rates for (usually) a standard haul between Cleveland and Chicago, calculating these two rates as a fraction of wholesale value per pound, then combining them into an index using as weights the amounts of the industry's output actually moving by truck and rail. Value added in the U.S. industry (1967) was used when necessary to construct weighted averages from Scherer's U.S. four-digit industries; sometimes some of the U.S. four-digit industries matched to a Canadian industry are unavailable, in which the available ones are used.

US467 Proportion of shipments by the U.S. counterpart industry accounted for by the largest four enterprises classified to that industry, 1967. Source: U.S. Bureau of the Census, Census of Manufactures, 1967 (Washington: Government Printing Office, 1971), Vol. I, Chapter 9, Table 5.

US867 Proportion of shipments by the U.S. counterpart industry accounted for by the largest eight enterprises classified to that industry, 1967. For source see US467.

VPE Value added minus entrepreneurial withdrawals divided by total number of establishments classified to the industry, averaged over 1961-1971. Source: Statistics Canada tape.

VPEUS Value added per manufacturing establishment classified to the United States counterpart industry, 1967. For source ECA67.

VPW Value added minus entrepreneurial withdrawals divided by total number of employees, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

VPWUS Value added by total activity divided by number of employees, manufacturing establishments classified to the U.S. counterpart industry, 1967. For source see ECA67.

VRT Value added in manufacturing activity divided by value of shipments of goods of own manufacture, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

VRTUS Value added in manufacturing activity divided by value of shipments, manufacturing establishments classified to the U.S. counterpart industry, 1967. For source see ECA67.

VRTD Dummy variable = 1 (otherwise 0) if the industry is characterized by small-scale establishments and either buys most of its purchased inputs or sells most of its output to another industry characterized by at least moderately high seller concentration and large establishments. VRTD was constructed judgmentally from the information contained in variables VPE and C868 with some reference to the input-output table. Values of unity were assigned to industries numbered 135, 151, 252, 272, 273, 274, 294, 296, 297, 298, 305, 325, 343, 345, 351, 355, and 372.

WNP Salaries paid per year to administrative, office, and other non-manufacturing employees divided by number of employees, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

WNPUS Total compensation of nonproduction workers (equals total payroll minus wages) divided by number of nonproduction workers, manufacturing establishments classified to the U.S. counterpart industry, 1967. For source see ECA67.

WPW Average wages paid per hour to manufacturing production and related workers, all manufacturing establishments, averaged over 1961-1971. Source: Statistics Canada tape.

WPWUS Wages paid to production workers divided by man-hours worked, manufacturing establishments classified to the United States counterpart industry, 1967. For source see ECA67.

Company variables

ADCG Average rate of return on the market value of the firm's common equity, as measured by the average of yearly observations for the firm of common dividends in year t plus capital gains in year t on common equity divided by the market value of common equity in year $t - 1$. Source: FRI tape.

ALNG Average of the yearly observations for the firm of interest and amortization on long-term debt divided by long-term debt. Source: FRI tape.

APCD Identical to APCR except that net income available for common equity is calculated by the deferred method of reporting taxes. See APCR. Source: FRI tape.

APCF Identical to APCR except that net income available for common equity is calculated by the flow-through method of reporting taxes. See APCR. Source: FRI tape.

APCR Average rate of return on the market value of the firm's common equity as measured by the average of yearly observations of net income in year t (as reported) available for common equity plus capital gains in year t divided by the market value of common equity in year $t - 1$. Net income available for common equity represents that part of income which the company reports it has available for distribution to common shareholders, and it depends on the method of reporting taxes. In general, it is net income minus taxes currently payable minus preferred dividend requirements. Source: FRI tape.

BETAD — Identical to BETAR except that net income available for common equity is calculated by the deferred method of reporting taxes. See BETAR and APCR. Source: FRI tape.

BETAF — Identical to BETAR except that net income available for common equity is calculated by the flow-through method of reporting taxes. See BETAR and APCR. Source: FRI tape.

BETAG — Slope coefficient from the regression $DCG_t = a + b(INDP)_t$ where DCG_t is the observation for the firm of common dividends in year t plus capital gains in year t on common equity divided by the market value of common equity in year $t - 1$. Source: FRI tape.

BETAR — Slope coefficient from the regression $PCR_t = a + b(INDP)_t$ where PCR_t is the observation for the firm of net income in year t (as reported) available for common equity plus capital gains in year t, divided by the market value of common equity in year $t - 1$. See APCR and INDP. Source: FRI tape.

CFS — Cash flow divided by net sales, 1961-1974. Source: FRI tape.

DC — Concentric measure of diversification. For method of construction see Chapter 4. Source: Dun & Bradstreet tape.

DE3 — Proportion of employees allocated to the company's principal three-digit industry (U.S. standard industrial classification). For method of construction see Chapter 4. Source: Dun & Bradstreet tape.

DE4 — Proportion of employees allocated to the company's principal four-digit industry (U.S. standard industrial classification). For method of construction see Chapter 4. Source: Dun & Bradstreet tape.

DH — Herfindahl measure of diversification. For method of construction see Chapter 4. Source: Dun & Bradstreet tape.

DRESG — Variance of the residuals from the regression $DCG_t = a + b(INDP)_t$ where DCG_t is the observation for the firm of common dividends in year t plus capital gains in year t on common equity divided by the market value of common equity in year $t - 1$. Source: FRI tape.

DW — Weighted measure of diversification. For method of construction see Chapter 4. Source: Dun & Bradstreet tape.

FD — Dummy variable, equals one if the company's ultimate parent is a U.S. enterprise, zero otherwise. (Subsidiaries of non-United States multinational companies could not be identified from the information at hand.) Source: Dun & Bradstreet tape.

FFS Ratio of total noncurrent assets to sales, 1961-1974. Source; FRI tape.

GRS Growth rate of sales: slope coefficient in regression of logarithm of net sales on time (first year reported =1, etc.), 1961-1964. Source: FRI tape.

IBP An index of the instability of net income (numerator of PEQR) calculated by dividing the absolute value of the difference between each pair of adjacent years' values of net income by the sum of the two years' figures, and summing over all adjacent year-pairs available maximum 1961-1974). Source: FRI tape.

INDP A yearly index of Canadian industrial production. Since the base year changed during the period covered, and the series using the different bases overlapped, all figures were converted to base 1963 = 100. Source: International Financial Statistics, International Monetary Fund, Washington, D.C. "Industrial Production." Volume XXI, Number 12 (Dec. 1968), p. 68; Volume XXII, Number 12 (Dec. 1969), p. 66; Volume XXIII, Number 12 (Dec. 70), p. 70; Volume XXIV, Number 12 (Dec. 71), p. 74; Volume XXV, Number 12 (Dec. 72), p. 74; Volume XXVI, Number 12 (Dec. 73), p. 76; Volume XXVII, Number 12 (Dec. 74), p. 78; Volume XXIX, Number 3 (Mar. 1976), p. 92.

KXS Amount spent in the year to acquire properties, plant, and equipment divided by net sales, 1961-1974. Source: FRI tape.

LEV Ratio of debt to equity: long-term debt plus preferred redemption premiums and preferred dividends in arrears to sum of common equity (book value), preferred stock capital, and equity of minority shareholders in consolidated subsidiaries, 1961-1974. Source: FRI tape.

MBV Ratio of market value to book value of common equity, 1961-1974. Market value of equity is calculated from the average of the high and low share prices for the year divided by the number of shares outstanding at the fiscal year end. Source: FRI tape.

NCA Ratio of net current assets to sales, 1961-1974. Source: FRI tape.

NGA Ratio of net value of property, plant and equipment to gross value of property, plant and equipment, 1961-1974. Source: FRI tape.

NP Number of plants engaged principally in manufacturing activities, as recorded in Dun & Bradstreet files. Source: Dun & Bradstreet tape.

NS Unduplicated number of activities (four-digit level of the U.S. standard industrial classification) carried out by manufacturing establishments belonging to the company. Source: Dun & Bradstreet tape.

NSM Unduplicated number of manufacturing activities (four-digit level of the U.S. standard industrial classification) carried out by manufacturing establishments belonging to the company. Source: Dun & Bradstreet tape.

PAS Net income plus interest and amortization divided by total capital (total assets minus current liabilities), 1961-1974. Source: FRI tape.

PEQD Net income (pretax income less current and deferred income taxes and minority interest) divided by sum of common equity (book value) and preferred stock capital, averaged over all years available (maximum 1961-1974). Source: FRI tape.

PEQF Net income (pretax income less current income taxes and minority interest) divided by sum of common equity (book value) and preferred stock capital, averaged over all years available (maximum 1961-1974). Source: FRI tape.

PEQR Net income as reported by the company divided by sum of common equity (book value) and preferred stock capital,averaged overall years available (maximum 1961-1974). I.e., PEQR is identical to either PEQD or PEQF.

PMAC Mean proportional absolute annual change in net income (numerator of PEQR), 1961-1974. Source: FRI tape.

PMC Mean proportional annual change in net income (numerator of PEQR), 1961-1974. Source: FRI tape.

PRESD Identical to PRESR except that net income available for common equity is calculated by the deferred method of reporting taxes. See PRESR and APCR. Source: FRI tape.

PRESF Identical to PRESR except that net income available for common equity is calculated by the flow-through method of reporting taxes. See PRESR and APCR. Source: FRI tape.

PRESR The variance of the residuals from the regression $PCR_t = a + b(INDP)_t$ where PCR_t is the observation for the firm net income in year t as reported--available for common equity plus capital gains in year t divided by the market value of common equity in year $t - 1$. See APCR. Source: FRI tape.

PS3 Principal three-digit industry (in United States standard industrial classification) that accounts for more of the company's allocated employment than any other. Source: Dun & Bradstreet tape. For the process of allocating company employment to industries see Chapter 4.

PS4 Principal four-digit industry that accounts for more of the company's allocated employment than any other. For source and method of construction see PS3.

PS3M Principal three-digit industry within manufacturing that accounts for more of the company's allocated employment than any other. For source and method of construction see PS3.

PS4M Principal four-digit industry within manufacturing that accounts for more of the company's allocated employment than any other manufacturing industry. For source and method of construction see PS3.

SDP Standard deviation of net income (numerator of PEQR) from trend, calculated by regressing net income on time (first year reported = 1, etc.). Logs were not taken because some profit figures are negative. Source: FRI tape.

SDS Standard deviation of net sales around trend line (from the regression used to compute GRS). Source: FRI tape.

SMC Mean proportional annual change in net sales, 1961-1974. Source: FRI tape.

SMAC Mean proportional absolute annual change in net sales, 1961-1974. Source: FRI tape.

TBIL Yearly average tender rate for Canadian three-month Treasury Bills in percent per annum. Source: International Monetary Fund, International Financial Statistics, "Money Market and Euro Dollar Rates." Volume XXVI, Number 12 (Dec. 1973), p. 26; Volume XXVII, Number 12 (Dec. 1974), p. 26; Volume XXIX, Number 3 (Mar. 1976), p.27.

TOTA Total assets (in millions of dollars), average of 1961-1974. Source: FRI tape.

VDCG Variance of the yearly observations for the firm of common dividends in year t plus capital gains in year t on common equity divided by the market value of common equity in year $t - 1$. Source: FRI tape.

VPCD Identical to VPCR except that net income available for common equity is calculated by the deferred method of reporting taxes. See VPCR and APCR. Source: FRI tape.

VPCF Identical to VPCR except that net income available for common equity is calculated by the flow-through method of reporting taxes. See VPCR and APCR. Source: FRI tape.

VPCR Variance of the yearly observations for the firm of net income in year *t* (as reported) available for common equity plus capital gains in year *t* divided by the market value of common equity in year *t* - 1. See APCR. Source: FRI tape.

Table A.1

Industries included in data base, with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
101	Slaughtering and meat processors	y	n
103	Poultry processors	y	y
105	Dairy factories	y	y
111	Fish products industry	y	y
112	Fruit and vegetable canners and preservers	n	n
123	Feed manufacturers	y	y
124	Flour mills	n	n
125	Breakfast cereal manufacturers	n	n
128	Biscuit manufacturers	y	y
129	Bakeries	y	y
131	Confectionery manufacturers	y	y
133	Sugar refineries	y	y
135	Vegetable oil mills	y	y
141	Soft drink manufacturers	y	y
143	Distilleries	y	y
145	Breweries	y	y
147	Wineries	y	y
151	Leaf tobacco processing	y	n
153	Tobacco products manufacturers	y	y
161	Rubber footwear manufacturers	y	y
163	Rubber tire and tube manufacturers	y	y
172	Leather tanneries	y	y
174	Shoe factories	n	n
175	Leather glove factories	y	y
183	Cotton yarn and cloth mills	n	n
193	Wool yarn mills	y	y
197	Wool cloth mills	y	y

Table A.1 (continued)

Industries included in data base, with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
201	Synthetic textile mills	n	n
211	Fibre preparing mills	n	n
212	Thread mills	y	y
213	Cordage and twine industry	n	n
214	Narrow fabric mills	y	y
215	Pressed and punched felt mills	n	y
216	Carpet, mat and rug industry	y	y
218	Textile dyeing and finishing plants	y	y
219	Linoleum and coated fabrics industry	n	n
221	Canvas products industry	y	y
223	Cotton and jute bag industry	y	n
231	Hosiery mills	y	y
243	Men's clothing industry	n	n
244	Women's clothing factories and contractors	n	n
245	Children's clothing factories	y	y
246	Fur goods industry	y	n
247	Hat and cap industry	y	y
248	Foundation garment industry	y	y
251	Shingle mills, saw mills and planing mills	y	y
252	Veneer and plywood mills	y	y
254	Hardwood flooring; sash, door and other millwork plants	n	n
256	Wooden box factories	n	n
258	Coffin and casket industry	y	y

Table A.1 (continued)

Industries included in data base, with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
261	Household furniture industry	y	n
264	Office furniture industry	y	y
266	Miscellaneous furniture industries	n	n
268	Electric lamp and shade industry	n	n
271	Pulp and paper mills	y	y
272	Asphalt roofing manufacturers	n	n
273	Manufacturers of carbons, boxes, paper and plastic bags	n	n
274	Miscellaneous paper converters	n	n
286	Commercial printing	n	n
287	Plate making, typesetting and trade bindery plants	n	n
288	Publishing only	y	y
289	Publishing and printing	y	y
291	Iron and steel mills	y	y
292	Steel pipe and tube mills	y	y
294	Iron foundries	y	y
295	Smelting and refining	y	y
296	Aluminium rolling, casting and extruding	y	y
297	Copper and alloy rolling, casting and extruding	y	y
298	Metal rolling, casting and extruding, N.E.C.	n	n
301	Boiler and plate works	y	y
302	Fabricated structural metal industry	y	y
303	Ornamental and architectural metal industry	y	y
304	Metal stamping, pressing and coating industry	n	n

Table A.1 (continued)

Industries included in data base, with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
305	Wire and wire products manufacturers	y	y
306	Hardware, tool and cutlery manufacturers	y	y
307	Heating equipment manufacturers	n	n
308	Machine shops	n	n
311	Agricultural implements industry	y	y
315	Miscellaneous machinery and equipment manufacturers	n	n
316	Commercial refrigeration and air conditioning equipment manufacturers	n	n
318	Office and store machinery manufacturers	y	y
321	Aircraft and parts manufacturers	n	n
323	Motor vehicle manufacturers	y	y
324	Truck body and trailer manufacturers	y	y
325	Motor vehicle parts and accessories manufacturers	y	y
326	Railroad rolling stock industry	y	y
327	Shipbuilding and repair	y	y
328	Boat building and repair	y	y
331	Manufacturers of small electrical appliances	y	y
332	Manufacturers of major electrical appliances	y	y
334	Manufacturers of household radio and television receivers	y	y
335	Communications equipment manu- manufacturers	n	n
336	Manufacturers of electrical industrial equipment	y	y

Table A.1 (continued)

Industries included in data base with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
337	Battery manufacturers	y	y
338	Electric wire and cable	n	y
341	Cement manufacturers	y	y
343	Lime manufacturers	y	n
345	Gypsum products manufacturers	y	y
347	Concrete products manufacturers	y	y
348	Ready-mix concrete manufacturers	y	y
351	Clay products manufacturers	n	n
352	Refractories manufacturers	y	y
353	Stone products manufacturers	y	y
354	Mineral wool manufacturers	n	n
355	Asbestos products manufacturers	n	n
356	Glass and glass products manufacturers	n	n
357	Abrasives manufacturers	y	y
365	Petroleum refineries	y	y
371	Explosives and ammunition manufacturers	n	n
372	Manufacturers of mixed fertilizers	n	n
373	Manufacturers of plastics and synthetic resins	y	y
374	Manufacturers of pharmaceuticals and medicines	y	y
375	Paint and varnish manufacturers	y	y
376	Manufacturers of soap and cleaning compounds	n	n
377	Manufacturers of toilet preparations	y	y
378	Manufacturers of industrial chemicals	n	n

Table A.1 (continued)

Industries included in data base with correspondence to counterpart industries in United States and to aggregated data on companies' output diversity

Standard Industrial Classification number	Industry	Matched to U.S. counterpart industry?	Matched to source of data on diversification?
381	Scientific and professional equipment manufacturers	y	y
382	Jewellery and silverware manufacturers	y	y
383	Broom, brush and mop industry	y	y
384	Venetian blind manufacturers	n	n
393	Sporting goods and toy industry	y	y
395	Fur dressing and dyeing industry	n	n
397	Signs and display industry	y	y

Table A-2 Companies included in data base with identifying numbers and primary manufacturing industry

Company	Identifying numbers* (1)	(2)	(3)
ABITIBI PAPER	1	271	20158187
ALCAN ALUMINUM	30	295	20209573
ALGOMA STEEL	21	291	20149512
ANDRES WINES	32	147	20534575
ANGLO-CAN PULP + PAPER	33	271	20240620
ATCO INDUSTRIES	49	254	20074506
B. C. FOREST PRODUCTS	108	251	20109486
B. C. SUGAR REFINERY	114	133	20109556
BOMAC BATTEN	708	287	20610306
BOMBARDIER	92	329	20566070
BOWES	97	139	20733757
BRIDGE AND TANK	100	302	20646801
BRIGHT,T.G.AND CO.	102	147	20132292
BRUCK MILLS	123	201	20212964
BURNS FOODS	129	101	20074880
CAE INDUSTRIES	168	335	20213145
CANADA CEMENT LAFARGE	141	341	20213355
CANADA MALTING	156	139	20161127
CANADA PACKERS	159	101	20161130
CANADIAN CANNERS	177	112	00913813
CANADIAN CELLULOSE	265	271	20795646
CANADIAN CORP. MGT.	178	309	20161209
CANADIAN FOOD PROD.	184	129	20704126
CANADIAN GENERAL ELECTRIC	189	336	00136796
CANADIAN IND.	204	371	20587332
CANADIAN MARCONI	213	335	20213560
CANRON	150	294	20213379
CARLING O'KEEFE	171	145	20161184
CELANESE CANADA	255	201	00132607
CHATEAU-GAI WINES	252	147	20920235
COLUMBIA BREWING	485	145	20095611
COMBINED ENGINEERED PROD.	266	315	20162352
CONSOLIDATED BATHURST	279	271	20215306
CONSOLIDATED TEXTILE MILL	282	201	20215305
CONSUMERS GLASS	288	356	20162493
CORBY DISTILLERY	294	143	20215440
CORPORATE FOODS	138	129	20161091
CRAIN (R.L.)	306	286	20137004
CRESTBROOK FOREST IND.	312	251	20520784
CROW'S NEST IND.	319	251	20096359
CROWN CORK AND SEAL	315	304	00228234
CROWN ZELLERBACH	318	271	00138152
DOFASCO	354	291	20053335
DOMCO INDS.	360	219	20216879
DOMIMION BRIDGE	339	302	20216895
DOMINION DAIRIES	345	105	20163718
DOMINION GLASS	357	356	20541510
DOMINION TEXTILE	369	183	20216957
DOMTAR	366	271	20216974
DONAHUE	372	271	20241521
DUPONT OF CANADA	375	378	00131570
EDDY MATCH	381	379	20641819
ELECTROHOME	348	334	20124453
ENHEAT	385	307	20407728
EXQUISITE FORM BRASSIERE	387	248	20715696
FEDERAL PIONEER	405	336	00214627
FITTINGS	396	294	20135653
FLEETWOOD	400	334	20541967
FORD MOTOR	402	323	00134474
FRASER COMPANIES	407	271	20019674
FRUEHAUF TRAILER	409	324	00130690
GENERAL BAKERIES	411	129	20044350
GOODYEAR TIRE AND RUBBER	417	163	00446792

*Identifying numbers are:

(1) Code assigned by Financial Research Institute.

(2) Primary manufacturing industry (pre-1970 Canadian standard industrial classification); see text for method of assigning companies to primary industries.

(3) Code assigned by Dun & Bradstreet.

Table A-2 Companies included in data base with identifying numbers and primary manufacturing industry

Company	Identifying numbers* (1)	(2)	(3)
GREATWEST STEEL IND.	431	302	20082286
GREB INDUSTRIES	433	174	20124567
GRISSOL FOODS	436	129	20220648
GSW LTD.	414	332	20165789
GULF OIL CANADA	105	365	20160611
HAND CHEMICALS IND.	445	371	20130668
HARDING CARPETS	447	216	20037341
HAWKER SIDDELEY CAN	450	321	20166818
HAYES-DANA	453	325	00504055
HIRAM WALKER-GOODERHAM & WORTS	909	143	20185455
IMASCO LTD.	471	153	20221699
IMPERIAL OIL	468	365	00121321
INGLIS (JOHN) CO. LTD	479	332	20167563
INTERPROV STEEL AND PIPE	498	291	20067573
KEEP-RITE PRODS.	514	316	20037425
KELSEY-HAYES CANADA	516	325	00535735
LABATT,JOHN	522	145	20127631
LAKE ONTARIO CEMENT	531	341	20168817
LAURA SECORD CANDY	538	131	20168992
LEIGH INSTRUMENTS	541	381	20039925
LIVINGSTON INDUSTRIES	545	256	20157543
MACLEAN HUNTER	565	289	20169820
MACMILLAN BLOEDEL	566	271	20113526
MAPLE LEAF MILLS	573	124	20556300
MASSEY-FERGUSON	579	311	20170256
MELCHERS DISTILLERIES	585	143	20226782
MIRON COMPANY	598	341	20227265
MITCHELL ROBT	600	304	20227341
MLW WORTHINGTON	612	326	04277248
MOORE CORP	618	286	20171180
NATIONAL SEA PRODUCTS	660	111	20027184
NIAGARA WIRE	646	305	20132788
PETROFINA CANADA	219	365	20213592
PHILLIPS CABLES	685	338	20038345
PRICE COMPANY	691	271	20242852
READERS' DIGEST ASSOC CANADA	711	288	00132593
REDPATH INDUSTRIES	147	133	20213365
REICHHOLD CHEMICALS	714	373	20173889
RIO ALGOM WINES	721	291	20174117
ROLLAND PAPER	741	271	20232651
RONALDS-FEDERATED	743	286	20232700
ROTHMANS OF PALLMALL	744	153	20408853
SCHNEIDER,J.M.	757	101	20125084
SCOTT PAPER	765	271	00128787
SEAGRAM CO.	336	143	20216804
SHAW PIPE	770	339	20551560
SHELL CANADA	771	365	20528229
SILVERWOOD IND	786	105	20128421
SKLAR FURNITURE LIMITED	783	261	20183286
SOUTHAM PRESS	798	289	20175745
ST. LAWRENCE CMT.	753	341	20503872
STAFFORD FOODS	801	112	20731171
STEEL CO. OF CANADA	813	291	20561407
TEXACO CANADA	834	365	00134516
THOMSON NEWSPAPERS	838	289	20176803
TORONTO STAR LTD.	845	289	20177141
UNION CARBIDE CANADA	873	378	00128900
VULCAN INDUSTRIAL	905	304	20145870
WCI CANADA	519	332	20410412
WELDWOOD OF CANADA	915	252	00121290
WESTEEL-ROSCO	921	304	20011887
WESTINGHOUSE CANADA	243	336	00500064

*Identifying numbers are:

(1) Code assigned by Financial Research Institute.

(2) Primary manufacturing industry (pre-1970 Canadian standard industrial classification); see text for method of assigning companies to primary industries.

(3) Code assigned by Dun & Bradstreet.

Appendix Table A.3 Minimum, maximum, mean, standard deviation and data availability, variables observed on 123 industries

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
1	CDN3	101.0000	397.0000	0	0	123	123	269.5039	82.69203
2	C465	6.4000	100.0000	10	0	113	113	52.7664	25.31796
3	C865	10.0000	100.0000	6	0	117	117	66.8880	26.47893
4	C468	6.7000	99.0000	1	0	122	122	52.5213	25.39417
5	C863	11.3000	100.0000	0	0	123	123	66.6528	25.99232
6	CVC	0.1500	1.6900	2	0	121	121	0.7492	0.33942
7	HEL	0.0040	0.7450	0	0	123	123	0.1307	0.11776
8	SPL	0.4000	65.0000	0	23	100	123	10.8837	12.23308
9	OWN	0.2000	95.0000	0	15	108	123	19.0203	19.59503
10	FET	-13.8000	103.4000	16	2	105	107	27.9262	19.46553
11	REG	1.0000	1.0000	0	93	30	123	0.2439	0.42943
12	ADI	0.1000	15.2000	0	1	122	123	1.4041	2.37991
13	EXP	0.0010	0.6810	10	3	110	113	0.0999	0.16363
14	IMP	0.0050	1.5480	10	2	111	113	0.2784	0.32840
15	FSS	0.0010	0.9980	38	5	80	85	0.3924	0.29466
16	FOI	-0.3520	0.2890	12	0	111	111	0.0889	0.05867
17	CORC	0.2760	1.5970	51	0	72	72	0.9524	0.20385
18	MESC	0.4400	27.8900	50	0	73	73	7.3863	5.69660
19	CORU	0.5990	1.5060	46	0	77	77	0.9590	0.17521
20	MESU	0.0540	12.5600	45	0	78	78	2.8296	2.43019
21	PHC	0.0200	1.5100	44	4	75	79	0.4094	0.22199
22	DCC	0.0420	2.0110	44	4	75	79	0.9659	0.48124
23	DWC	0.0120	1.0020	44	4	75	79	0.4047	0.24847
24	NPC	1.0000	21.5480	44	0	79	79	4.6240	3.93392
25	NSC	1.0000	16.0530	44	0	79	79	4.6764	3.30086
26	DE3C	0.1860	1.0000	44	0	79	79	0.7432	0.15222
27	DE4C	0.3450	1.0000	44	0	79	79	0.6984	0.14742
28	PRCN	0.0040	0.1120	44	68	11	79	0.0047	0.01651
29	SVC	0.0010	0.2050	44	15	64	79	0.0346	0.04127
30	NCA67	7.0000	2275.0000	10	0	113	113	246.8584	431.59058
31	NCA63	6.0000	3167.0000	11	0	112	112	255.6964	493.60815
32	NCA58	7.0000	1347.0000	33	0	90	90	146.1111	218.94450
33	NUS67	40.0000	20128.0000	10	0	113	113	1908.8494	3134.97217
34	NUS63	36.0000	20100.0000	11	0	112	112	2002.3481	3252.20752
35	NUS58	27.0000	11272.0000	33	0	90	90	1337.3110	1673.13086
36	PPR67	39.8724	129.1990	9	0	114	114	79.1720	15.72626
37	PPR63	42.8816	136.4256	11	0	112	112	78.6470	16.78555
38	PPR58	52.5210	151.2859	33	0	90	90	79.6401	18.20111
39	LAB167	6.9541	20.7900	10	0	113	113	11.3002	2.28564
40	LAB163	6.4020	20.5339	11	0	112	112	10.7785	2.17855

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	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
41	LAB158	5.3821	20.0401	33	0	90	90	10.4422	1.99951
42	FCA67	183.0000	75719.0000	9	0	114	114	12659.8477	15233.3008
43	EUS67	4500.0000	**********	9	0	114	114	127048.187	164789.312
44	RPRS	1.0630	142.9500	48	0	75	75	91.5863	21.40053
45	RPRL	0.0000	266.6201	46	0	77	77	92.4343	30.73811
46	RS	1.0000	1.0000	9	29	85	114	0.7456	0.43552
47	VRT	0.1292	0.7893	0	0	123	123	0.4812	0.13178
48	NPW	0.0994	1.0000	0	0	123	123	0.2788	0.13243
49	WPW	1.4359	3.8685	1	0	122	122	2.4088	0.54546
50	WNP	4.8061	8.6480	0	0	123	123	6.7780	0.78922
51	VPW	5.0797	34.4636	0	0	123	123	11.2622	5.07134
52	VPF	36.0863	38357.1484	0	0	123	123	1951.4893	4265.52344
53	FIN	0.0050	0.9801	0	0	123	123	0.3517	0.18800
54	PRB	0.0035	0.8457	0	16	107	123	0.2140	0.20525
55	GSI	-0.0552	0.1938	0	0	123	123	0.0693	0.03813
56	SST	0.0024	0.0243	0	0	123	123	0.0073	0.00420
57	GNF	-0.0860	0.0982	0	0	123	123	0.0032	0.03547
58	CVPE	-0.1227	3.9436	0	0	123	123	1.0405	0.71334
59	CFCT	-1.0000	0.4202	0	0	123	123	-0.1205	0.19525
60	SMCI	-0.0538	0.2137	0	0	123	123	0.0763	0.03892
61	SACI	0.0361	0.2149	0	0	123	123	0.0963	0.03497
62	NEMC	-0.0787	0.0977	0	0	123	123	0.0053	0.03445
63	LAB2C	3.7900	231.7100	38	0	85	85	65.3442	37.97159
64	FSF	0.0000	1.0000	31	0	92	92	0.4754	0.29200
65	FRS	0.0350	3.4520	49	0	74	74	0.3776	0.45441
66	FRW	0.6460	1.0780	49	0	74	74	0.9043	0.09731
67	FRP	0.4710	1.2110	49	0	74	74	0.8111	0.15807
68	FRV	0.2680	1.5500	49	0	74	74	0.9582	0.20119
69	FRN	0.3760	2.4020	49	0	74	74	0.8646	0.26225
70	LAB2U	5.9500	168.4600	54	0	69	69	64.7662	42.98454
71	PCMC	7.0000	56.9000	10	0	113	113	22.2027	9.01942
72	PCMU	4.9000	59.0000	10	0	113	113	25.1903	9.15616
73	US468	5.0000	91.0000	38	0	85	85	37.8235	19.61761
74	US868	5.7000	97.0000	38	0	85	85	50.0906	22.84984
75	VRTUS	9.7000	76.8000	39	0	84	84	46.5440	13.39224
76	NPWUS	2.2000	63.0000	39	0	84	84	21.6809	11.40723
77	WPWUS	1.7400	4.3200	39	0	84	84	2.8120	0.60876
78	WNPUS	1.0200	13.0400	39	0	84	84	8.7639	1.56802
79	VPWUS	5.7000	43.3000	39	0	84	84	15.2726	7.60764
80	VPFUS	90.0000	13269.0000	39	0	84	84	2211.2737	2684.34253

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
81	NPW	1.0500	14.2000	59	0	64	64	2.4275	2.33708
82	OWNU	1.5000	89.2000	54	0	69	69	25.9246	14.83107
83	SPLU	3.9000	54.1000	54	0	69	69	18.4275	11.28428
84	FXPU	1.0000	18.0000	54	16	53	69	2.9710	3.31431
85	IMPU	1.0000	28.0000	61	15	47	62	5.3065	8.19439
86	C468	6.7000	95.8000	31	0	92	92	52.2000	23.34122
87	C868	11.3000	100.0000	34	0	89	89	65.6393	24.25409
88	C470	7.2000	96.8000	35	0	88	88	52.2091	23.40056
89	C870	11.8000	100.0000	38	0	85	85	65.5400	24.33034
90	HFL65	0.0043	0.4361	27	0	96	96	0.1255	0.09834
91	HFL68	0.0039	0.6668	27	0	96	96	0.1312	0.11168
92	HFL70	0.0042	0.5125	26	0	97	97	0.1253	0.09933
93	MOT	0.4000	30.0000	48	1	74	75	15.1653	8.13695
94	ATS	0.2230	2.7980	1	0	122	122	0.8038	0.32859
95	CONS	0.0020	0.9460	8	20	95	115	0.2856	0.31207
96	VPT67	0.1105	0.7874	0	0	123	123	0.4780	0.13462
97	NPW67	0.0896	1.0000	0	0	123	123	0.2758	0.13504
98	WPW67	1.3862	3.8210	1	0	122	122	2.4306	0.54102
99	WNP67	4.7444	8.7622	0	0	123	123	6.8569	0.76250
100	VPW67	5.1942	35.5852	0	0	123	123	11.3835	5.19644
101	VPE67	42.3844	47156.2227	0	0	123	123	2054.3149	4950.04687

Appendix Table A.4 Minimum, maximum, mean, standard deviation and data availability, variables observed on 125 companies*

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
1	DUNS	0.0000	0.0000	0	0	125	125	0.0000	0.0
2	SUB	3.0000	13.0000	0	0	125	125	11.0080	1.92040
3	PS3	201.0000	399.0000	0	0	125	125	282.3198	59.45897
4	PS4	2011.0000	3996.0000	0	0	125	125	2833.1680	595.89771
5	PS3M	201.0000	399.0000	0	0	125	125	282.3198	59.45897
6	PS4M	2011.0000	3996.0000	0	0	125	125	2833.1680	595.89771
7	DE3	0.2200	1.0000	0	0	125	125	0.6745	0.22572
8	DE4	0.2000	1.0000	0	0	125	125	0.6217	0.22437
9	DH	0.0200	0.8900	0	13	112	125	0.4995	0.25576
10	DW	0.0300	1.4700	0	16	109	125	0.5137	0.37959
11	DC	0.0200	2.4400	0	13	112	125	1.1990	0.67405
12	NP	1.0000	53.0000	0	0	125	125	6.9200	7.06948
13	NS	1.0000	31.0000	0	0	125	125	6.3520	5.14782
14	NSM	1.0000	28.0000	0	0	125	125	5.2720	4.45848
15	PR	0.0200	0.1500	0	118	7	125	0.0038	0.01946
16	S15	**********	**********	0	125	0	125	0.0	0.0
17	SV	0.0100	0.4300	0	73	52	125	0.0376	0.07712
18	FD	**********	**********	0	125	0	125	0.0	0.0
19	PEQR	-0.4028	0.2764	0	0	125	125	0.0947	0.06847
20	PEQF	-0.4893	0.3138	0	0	125	125	0.1049	0.07823
21	PEQD	-0.4608	0.3001	2	0	123	123	0.0927	0.08237
22	PAS	-0.0331	0.2198	0	0	125	125	0.0905	0.03374
23	MBV	0.3311	5.2925	0	0	125	125	1.4364	0.87354
24	NGA	0.2655	0.8697	0	0	125	125	0.5167	0.11505
25	LEV	0.0103	5.3938	3	0	122	122	0.4072	0.53855
26	LEVR	**********	**********	125	0	0	0	0.0	0.0
27	NCA	0.0080	0.6808	1	0	124	124	0.2185	0.12437
28	FAS	0.2188	0.2188	124	0	1	1	0.2188	0.0
29	FFS	0.0561	1.8174	1	0	124	124	0.5025	0.37439
30	CFS	-0.0099	0.1980	1	0	124	124	0.0879	0.04600
31	KXS	0.0064	0.5825	1	0	124	124	0.0717	0.06588
32	TOTA	2.3462	1950.1270	0	0	125	125	159.5712	288.85010
33	GRS	-0.0363	0.5657	1	0	124	124	0.1145	0.08541
34	SDS	0.0000	0.6362	1	0	124	124	0.0273	0.06283
35	SDP	0.0006	1230.1382	0	0	125	125	38.0601	133.62662
36	IBP	-47.1699	33.4399	0	0	125	125	1.1834	7.05357
37	SMC	-0.0339	1.0753	1	0	124	124	0.1495	0.13169
38	SMAC	0.0314	1.0975	1	0	124	124	0.1719	0.12883
39	PMC	-10.8269	40.8474	0	0	125	125	0.4747	3.96252
40	PMAC	-2.9346	42.0116	0	0	125	125	1.0484	4.08934

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
41	RS1	-3572.0937	0.0388	50	10	65	75	-47.6252	409.71094
42	RS2	0.0057	0.0057	124	0	1	1	0.0057	0.0
43	RSHT	-1781.4102	0.1006	10	1	114	115	-15.4855	165.39398
44	RMCE	-1.1808	3.1237	0	0	125	125	0.3738	0.65583
45	ADCG	-0.3240	0.9021	0	0	125	125	0.1327	0.14374
46	APCR	-0.3277	1.1116	0	0	125	125	0.1939	0.17005
47	APCF	-0.3266	1.1396	0	0	125	125	0.2053	0.17321
48	APCD	-0.4903	1.1116	2	0	123	123	0.1893	0.19131
49	VDCG	0.0095	7.7176	0	0	125	125	0.1823	0.70316
50	VPCR	0.0119	10.5339	0	0	125	125	0.2379	0.95737
51	VPCF	0.0122	10.6185	0	0	125	125	0.2443	0.96551
52	VPCD	0.0037	10.5339	2	1	122	123	0.2380	0.96389
53	BETAG	-0.1063	63439.2266	1	0	124	124	511.6040	5673.99219
54	BETAR	-0.1204	**********	0	0	125	125	40387.6172	409610.750
55	BETAF	-0.1213	**********	0	0	125	125	31072.4609	311998.062
56	BETAD	-0.1204	**********	2	1	122	123	39970.9766	411946.750
57	PRESG	0.0000	7.4116	0	0	125	125	0.1508	0.65948
58	PRESR	0.0000	10.1120	0	0	125	125	0.1957	0.89920
59	PRESF	0.0000	10.1907	0	0	125	125	0.2005	0.90598
60	PRESD	0.0000	10.1120	2	1	122	123	0.1912	0.90603
61	ASRT1	0.0229	0.7029	50	0	75	75	0.1071	0.09269
62	ASRT2	0.0765	0.0765	124	0	1	1	0.0765	0.0
63	ALNG1	0.0124	0.8231	4	0	121	121	0.0912	0.10887
64	ALNG2	**********	**********	125	0	0	0	0.0	0.0
65	APR	-0.1910	0.1730	0	0	125	125	0.0774	0.04395
66	APF	-0.2165	0.2167	0	0	125	125	0.0870	0.05127
67	APD	-0.2618	0.2679	2	0	123	123	0.0756	0.05545
68	VPR	0.0000	0.1702	0	0	125	125	0.0076	0.02043
69	VPF	0.0000	0.1762	0	0	125	125	0.0102	0.02489
70	VPD	0.0000	0.1933	2	1	122	123	0.0077	0.02153
71	BETPR	-0.0077	0.0062	0	0	125	125	0.0004	0.00168
72	BETPF	-0.0101	0.0061	0	0	125	125	0.0005	0.00194
73	BETPD	-0.0073	0.0066	2	1	122	123	0.0005	0.00205
74	RESPR	0.0000	0.1263	0	0	125	125	0.0052	0.01438
75	RESPF	0.0000	0.1196	0	0	125	125	0.0070	0.01660
76	RESPD	0.0000	0.1597	2	1	122	123	0.0054	0.01695
77	SLS	2.6939	1596.7212	1	0	124	124	168.6787	276.98926
78	SHTD	0.1623	114.7218	10	0	115	115	11.0906	18.35330
79	MCE	1.4520	2615.3911	0	0	125	125	127.1745	296.32764
80	CDN3	101.0000	381.0000	6	0	119	119	259.2688	83.36420

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
81	C465	9.1000	99.0000	13	0	112	112	54.8000	23.60683
82	C865	13.4000	100.0000	10	0	115	115	69.5391	23.76134
83	C468	10.3000	99.0000	6	0	119	119	53.2891	23.51529
84	C868	15.6000	100.0000	6	0	119	119	67.6210	23.33807
85	CVC	0.2400	1.6900	6	0	119	119	0.7550	0.34579
86	HFL	0.0060	0.4830	6	0	119	119	0.1244	0.10043
87	SPL	0.4000	65.0000	6	8	111	119	17.7756	15.11375
88	OWN	0.2000	65.0000	6	12	107	119	15.5277	14.76541
89	EFT	-13.8000	66.8000	10	2	113	115	23.2956	16.95343
90	REG	1.0000	1.0000	6	87	32	119	0.2689	0.44339
91	ADI	0.1000	6.6000	6	3	116	119	1.1731	1.52396
92	EXP	0.0020	0.6810	9	0	116	116	0.1728	0.24176
93	IMP	0.0050	1.5480	9	0	116	116	0.2357	0.30220
94	FSS	0.0010	0.9980	17	6	102	108	0.3992	0.29907
95	ROI	-0.0390	0.2890	9	0	116	116	0.0936	0.05534
96	CDRC	0.5910	1.5970	48	0	77	77	0.9746	0.18389
97	MESC	0.5200	16.3100	48	0	77	77	6.0045	4.44877
98	CDRU	0.6520	1.2020	43	0	82	82	0.9317	0.12955
99	MESU	0.0540	12.5600	43	0	82	82	2.3734	2.20748
100	DHC	0.0200	0.6850	41	0	84	84	0.4707	0.17396
101	DCC	0.0420	1.8220	41	0	84	84	1.1376	0.44038
102	DWC	0.0120	0.9280	41	0	84	84	0.4797	0.22660
103	NPC	1.0000	21.5480	41	0	84	84	8.8831	6.22707
104	NSC	1.6960	16.0530	41	0	84	84	7.5690	4.67661
105	DE3C	0.1860	0.9940	41	0	84	84	0.6840	0.15740
106	DE4C	0.4440	0.9900	41	0	84	84	0.6438	0.14609
107	PRCN	0.0040	0.0160	41	65	19	84	0.0023	0.00485
108	SVC	0.0020	0.2050	41	2	82	84	0.0434	0.04395
109	NCA67	13.0000	2275.0000	12	0	113	113	396.9556	647.28271
110	MCA63	10.0000	3167.0000	12	0	113	113	424.7078	765.64233
111	NCA58	8.0000	1347.0000	54	0	71	71	102.4930	173.66235
112	NUS67	112.0000	20128.0000	12	0	113	113	2995.3628	4591.91016
113	NUS63	102.0000	20100.0000	12	0	113	113	3094.1150	4725.86328
114	NUS58	122.0000	5304.0000	54	0	71	71	1141.1406	1210.46265
115	RPR67	4.8662	11.3636	12	0	113	113	7.8744	1.31882
116	RPR63	5.0865	10.9409	12	0	113	113	8.1671	1.46114
117	RPR58	5.2910	13.4409	54	0	71	71	8.4465	1.79449
118	LAB167	6.9541	19.4552	12	0	113	113	11.2587	2.05649
119	LAB163	7.1582	20.5339	12	0	113	113	10.3431	1.96243
120	LAB158	5.5402	20.0401	54	0	71	71	10.2390	2.51639

	NAME	MINIMUM	MAXIMUM	# NA	# =0	# NE 0	#GOOD	MEAN	STD DEV
121	ECA67	801.0000	75719.0000	12	0	113	113	26742.3594	22908.8008
122	EUS67	6800.0000	**********	12	0	113	113	228633.625	203353.812
123	RPRS	39.3700	241.2500	69	0	56	56	108.1807	37.48830
124	RPRL	44.6400	182.4400	69	0	56	56	101.8836	36.59996
125	RS	1.0000	1.0000	12	26	87	113	0.7699	0.42089
126	VRT	0.1824	0.7693	6	0	119	119	0.4908	0.13798
127	NPW	0.0994	1.0000	6	0	119	119	0.2971	0.12512
128	WPW	1.4359	3.8685	7	0	118	118	2.8020	0.55486
129	WNP	4.8674	8.6480	6	0	119	119	7.1305	0.89944
130	VPW	5.4745	34.4636	6	0	119	119	14.0757	6.90296
131	VPE	96.2780	38357.1484	6	0	119	119	3821.8706	5018.36719
132	FIN	0.0184	0.9801	6	0	119	119	0.3304	0.21267
133	PRB	0.0035	0.8457	6	24	95	119	0.1696	0.22999
134	GSI	-0.0010	0.1938	6	0	119	119	0.0743	0.02951
135	SSI	0.0028	0.0243	6	0	119	119	0.0062	0.00366
136	GNE	-0.0807	0.0982	6	0	119	119	0.0123	0.03658
137	CVPE	-0.1227	3.8205	6	0	119	119	0.9317	0.75713
138	CECT	-1.0000	0.4202	6	0	119	119	-0.1151	0.18538
139	SMCI	0.0136	0.2137	6	0	119	119	0.0802	0.03269
140	SACI	0.0384	0.2149	6	0	119	119	0.0915	0.03619
141	NEMC	-0.0723	0.0977	6	0	119	119	0.0131	0.03561

*Some variables listed in this table have not been utilized in our research and therefore are not described in the text of this appendix. Industry variables are those pertaining to the company's base industry. Industry variables representing weighted averages of the companies' activities (designated by prefix W) are not shown.

APPENDIX B

Advertising: Canadian and Comparative U.S. Data

Data on advertising in Canada and on comparative advertising in the U.S. was derived from four basic sources:

1. Dominion Bureau of Statistics, Advertising Expenditures in Canada - 1965, October, 1968: This source contains a variety of data on advertising in Canada by industry. The primary data taken from this source were advertising to sales ratios in a wide sample of Canadian 4-digit manufacturing industries (Table 15 "Advertising Ratios in Manufacturing for Selected Industries, 1965"). These advertising to sales ratios were averages of all firms in the industry, and included media costs, advertising agency commissions and the preparation costs of the advertisements. Marketing research and sales promotion with samples and premiums were not included, and neither were advertising outlays outside of Canada. Based on aggregate figures for manufacturing industries presented in the Report, advertising outside of Canada by firms operating in Canada amounted to only 1.6 percent of total advertising by manufacturing industries.
2. Elliott Research: This source contains data on Canadian advertising expenditures by advertising medium for 1324 firms operating in Canada in 1972. Included media are radio, network television, spot television, magazines and other print media (largely newspapers). Advertising outlays in

the Elliott data included media cost only, and not advertising agency fees and the preparation cost of the advertisements. However, non-media costs were estimated at only approximately 10% of advertising cost for Canadian manufacturers. (DBS, Advertising Expenditures in Canada - 1965.) Point of sale advertising and trade publication advertising were not included. This data was unavailable for other years besides 1972.

3. U.S. Internal Revenue Service, Sourcebooks of the Statistics of Income, 1965: This source contains income and balance sheet data for approximately 3-digit "IRS Minor" United States industries, constructed by summing data for the individual firms classified to their primary industries. Total advertising expenditures of the firms to the industry could be related to total industry shipments. These advertising expenditures include all media and preparation costs and thus are consistent with the Canadian data in Source 1. However, they also include any advertising expenditures made outside the United States by the firm and to this extent are not consistent with the Canadian data. Since total sales are similarly all inclusive, the bias introduced by this difference is likely to be minor.

4. Leading National Advertisers, Inc. National Advertising Investments - 1970 and American Newspaper Publishers Association, Expenditures by National Advertisers in Newspapers - 1970: These sources contain advertising expenditures in the United States by advertising medium for a large number of firms

operating in the United States. The included media are radio, network television, spot television, magazines, national newspaper supplements, outdoor advertising (billboards) and local newspapers. The data include media cost only, and not the cost of preparation of the advertisements This makes them consistent with the Elliott data (Source #2).

While the U.S. media sources were both available for 1972, Expenditures by National Advertisers in Newspapers had been restructured in a form which made it unusable in compiling total newspaper advertising expenditures for firms. In the 1972 publication advertising outlays in newspapers were given by brand names classified into product groups, and the firm to which the brand belonged was not identified. Thus it was necessary to use the 1970 publication (which gave total newspaper advertising by firm) to match with the 1972 Canadian data described above. Since the mix of media should be relatively stable (though the level of advertising expenditure may not be), the use of different years for comparative purposes was not believed to undermine the usefulness of the results.

These four basic sources were utilized to perform five broad classes of analyses. These will be described below, with emphasis on the sources and construction of the data used in each analysis.

I. Effect of Advertising Rates on Firm Performance.

One segment of our research was the investigation of firm strategy classifications, diversification and other

aspects of firm behavior. The basic research design and sources of data for this study are described in the Chapters above and in Appendix A. Advertising expenditures of the firms in the sample were not included in the FRI data, and the Elliott Research data was used to construct advertising data for some of the firms in the FRI sample. Of the firms in our FRI sample, 54 could be identified in the Elliott Research data. For these firms, their total advertising on the media given in the Elliott data and the percentage of their total advertising represented by expenditures on each medium were added to the FRI data base.

II. Media Mix and Industry Performance

The 1324 Elliott firms were classified to their primary Canadian industry where possible. The firms were then grouped by industry, and the average media mix for the firms in each industry was computed for each of the 28 Canadian consumer goods industries which contained at least 5 Elliot firms. The average media mix for the group of firms classified in the industry was computed as follows. For each advertising medium, outlays of all the industry's firms on it were summed. These were in turn summed to yield the total outlays on all media of the firms in the industry. Combining the two, we computed the percent of outlays on each medium to the total media outlays of the industry. This procedure yielded a weighted average media mix for the industry, weighted by the size of advertising outlays of individual firms. The media mix variable was included in the Canadian industry sample described in Appendix A.

III. Comparative Canadian and U.S. Industry Advertising Rates

In order to compute comparable advertising rates for Canada and the U.S. industries, it was necessary to match industries across the two countries at the IRS Minor level of aggregation, which were somewhat more aggregated than the industries used in the other industry regressions in the study. IRS Minors are at approximately the 3-digit level of aggregation, and in many cases were broader than the corresponding Canadian industries. Using concordance tables, however, it was possible to aggregate the Canadian SIC industries to their IRS Minor counterparts in many cases. In the few cases where the Canadian SIC was broader than the IRS Minor classification, IRS Minors were aggregated to be consistent to the Canadian industry.

For a total of 46 industries, 31 of which were consumer goods industries, a satisfactory match was possible. These are listed in Table B-1, which gives the component Canadian industries making up the IRS Minor industry. For these matched industries, the following data were tabulated:

advertising to sales ratio (A/S): Canadian A/S were taken from source #1 and United States A/S were taken from source #3. Where necessary, Canadian industry observations were weighted by 1965 industry shipments to yield the weighted average A/S at the matched level of aggregation.

United States Four-Firm and Eight-Firm Concentration Ratios, 1963	Concentration Ratios were obtained from Concentration Ratios in Manufacturing Industry, 1963 for 4-digit U.S. industries. These were weighted using 1963 value of shipments to yield the weighted average concentration ratios for IRS Minor industries.
Canadian Four-Firm and Eight-Firm Concentration Ratios, 1965	The source of this data is described in Appendix A. Where necessary, observations for Canadian industries were weighted by 1965 industry shipments to yield the weighted average Canadian concentration ratios at the matched level of aggregation.
United States Industry Growth in Shipments, 1958-65	Growth was computed by dividing 1965 Business Receipts by 1958 Business Receipts for each IRS Minor industry, as taken from the Internal Revenue Service, Sourcebook of Statistics of Income 1965 (line 34) and 1958 (Line 37).
Canadian Industry Growth in Shipments, 1958-65	The source of this data is described in Appendix A.

Effective Rate of Tariff Protection for the Matched Canadian Industry	The source of this data is described in Appendix A. Where necessary, observations for component Canadian industries were weighted by 1965 shipments to yield weighted average effective tariff protection for the matched level of aggregation.
Imports for the Matched Canadian Industry	The source of this data is described in Appendix A. Where necessary, observations for component Canadian industries were weighted by 1965 shipments to yield weighted average imports for the matched level of aggregation.
Exports for the Matched Canadian Industry	The source of this data is described in Appendix A. Where necessary, observations for component Canadian industries were weighted by 1965 shipments to yield weighted average exports for the matched level of aggregation.
Foreign Ownership Share for the Matched Canadian Canadian Industry	The source of this data is described in Appendix A. Where necessary, observations for component Canadian industries were weighted by 1965 shipments to yield weighted average foreign ownership share for the matched level of aggregation.

Where no data was available on FSE for an industry or any member of the group of 4-digit industries in the 3-digit industry, FSE was assumed to be zero:

CDN SIC	GROUP	ASSUMED VALUE
172	172, 175, 179	0
175	172, 175, 179	0
179	172, 175, 179	0
239	231, 239	0
245	244, 245, 248	0

In other industries for which FSE was available for some 4-digit industries in the 3-digit industry, it was assumed that FSE equalled the weighted average of the other industries in its group:

107	105, 107	0.290
264	264, 266	0.181
338	295, 296, 297, 298, 338	0.644
343	343, 345, 347, 348	0.235

Total Sale of the United States Industry, 1965

1965 "Business Receipts," from Internal Revenue Service Sourcebook of Statistics of Income, 1965, Line 34.

Total Sales of the Canadian Industry, 1965

1965 "Shipments of Goods of Own Manufacture," from Dominion Bureau of Statistics, Census of Manufactures, 1965, v. 1, Table 7. Where necessary, the sales of component Canadian industries were summed to yield total sales of the industry at the matched level of aggregation.

IV. Comparative Mix of Advertising Media in Matched U.S. and Canadian Industries

Data on the mix of advertising expenditures by media in 38 U.S. IRS Minor consumer goods industries for 1967 was developed in a recent paper by Porter ("Interbrand Choice, Media Mix and Market Performance", AMERICAN ECONOMIC REVIEW, Vol. 66 (May 1976, pp. 398-406). Comparative data on media mix in the Canadian consumer goods industries which could be matched to this sample was developed as follows. The firms included in the Elliott Research advertising data were classfied, where possible, into their primary SIC industry. All the firms so classified were then grouped by industry, and the industries matched to the U.S. IRS Minor industries where possible. This procedure yielded a sample of 28 matched consumer good industries.

Where the U.S. and Canadian industries matched with no aggregation required the average media mix for the Elliott firms classified to that industry was computed. This was done by summing the expenditures of all Elliott firms in the industry on each medium, and computing the ratio of these to the total outlays on all media of the firms.

Where a number of Canadian industries made up the U.S. IRS Minor industry, this procedure was repeated for all the firms classified into any of the component Canadian industries making up the U.S. IRS Minor industry taken as a group. This procedure was followed rather than taking a weighted average of the Canadian industry observations because it was more comparable to the way the U.S. media mix data was computed by Porter. The U.S. data was obtained by averaging the media mix of the five leading firms in each of the 38 IRS Minor industries in the

Porter sample. Since some of these firms may have had one four-digit industry as their primary industry and others different four-digit components of the same IRS Minor industry, the procedure in the U.S. data was closer to an average media mix for all the leading firms producing any primary product in the industry rather than weighted averages of the media mix for the firms producing each primary product.

V. Comparative Media Mix in Consumer Goods Firms Operating in Both Canada and the United States

Another approach was taken to the comparison of the mix of advertising media employed by firms in the U.S. and Canada. We identified consumer goods firms in the Elliott Research data which also had significant operations in the United States. Some of these firms were subsidiaries of U.S. companies, some were subsidiaries of companies having another home country, and others were Canadian firms which also operated in the U.S.

The Elliott Research data gave the expenditures of these firms on a variety of advertising media as described earlier. Data on the firms' expenditures on corresponding advertising media in the United States were obtained from <u>National Advertising Investments</u> and <u>Expenditures of National Advertisers on Newspapers</u>, also described earlier. Comparative media data was available for a total of 143 firms using this procedure. These firms could be grouped into a number of broad industry groups for further comparative purposes. The industry groups are shown in Table B-1 .

Table B-1 Comparative Advertising to Sales Ratios in Matched Canadian and United States Industries, 1965

Canadian Industry	Canadian SIC	Advertising/ Sales	U.S. Industry	U.S. IRS Minor	Advertising / Sales
1. Meat & Poultry Slaughtering and Packing, etc.	1011,1013,103	0.36%	Meat Products	2010	0.57%
2. Dairy and Cheese	105,107	0.65%	Dairy Products	2020	1.78%
3. Fish Products; Fruit & Vegetable Canners	111,112	1.96%	Canned and Frozen Foods	2030	2.84%
4. Grain, Mill Products	123,124,125	1.85%	Grain Mill Products	2040	3.24%
5. Bakery Products	128,129	1.28%	Bakery Products	2050	2.50%
6. Confectionary	131	4.78%	Confectionary and Related Products	2070	3.21%
7. Sugar Refineries	133	0.19%	Sugar	2060	0.31%
8. Soft Drink Manufacturer	141	8.20%	Bottled Soft Drinks and Flavoring	2086	5.99%
9. Distilleries	143	2.74%	Distilled, Rectified and Blended Liquors	2085	2.62
0. Breweries	145	6.56%	Malt Liquors and Malt	2082	6.82%
11. Wineries	147	3.99%	Wines, Brandy and Brandy Spirits	2084	4.47%
12. Tobacco Products Mfrs.	151,153	6.13%	Tobacco Manufacturers	2100	5.78%
13. Tire and Tube Manufacturers	163	1.40%	Tires and Inner Tubes	3010	2.23%
14. Luggage, Handbag & Other Leather Goods	172,175,179	0.90%	Leather Tanning & Finishing	3198	0.81%
15. Shoe Factories	174	1.15%	Footwear, Except Rubber	3140	1.51%
16. Wool Cloth Mills	197	0.11%	Broadwoven Fabric Mills & Finishing,Wool	2220	0.29%
17. Carpet, Rug and Mat	216	1.11%	Carpets & Rugs: Woven, Tufted & Braided	2270	0.92%
18. Hosiery and Knitting Mills	231,239	1.09%	Knitting Mills	2250	1.07%

Table B-1 (cont'd.)

19. Men's Clothing	243	1.31%	Men's & Boy's Clothing	2310	1.30%
20. Women, Children's Clothing, Foundation Garments	244,245,248	0.87%	Women's, Children's, and Infants Clothing	2330	0.85%
21. Veneer & Plywood; Doors; Hardwood Flooring	252,2541,2542	0.38%	Millwork, Veneers, Plywood & Prefab. Structural Products	2430	0.54%
22. Household Furniture	261	1.11%	Household Furniture	2510	1.11%
23. Office & Other Furniture	264,266	1.12%	Furniture, Fixtures, except Household Furniture	2590	0.93%
24. Paper Box, Bag & Other Conv. Paper	273,274	0.58%	Converted Paper & Paperboard Products	2640,2650	0.51%
25. Commercial Printing	286	0.43%	Printing: Books & Business Forms	2720	0.52%
26. Iron & Steel Mills, Pipe Tube, Foundries	291,292,294	0.16%	Blast Furnaces, Steel Works, Foundries, and Forgings	3310	0.25%
27. Nonferrous Smelting, Refining, Fabrications	295,296,297,298,338	0.18%	Smelting, Refining, Rolling, Alloying of Nonferrous Metals	3330	0.49%
28. Hardware, Tool & Cutlery	306	3.41%	Cutlery, Hand Tools, General Hardware	3420	3.32%
29. Agricultural Implements	311	0.98%	Farm Machinery & Equipment	3520	0.95%
30. Office and Store Machinery	318	0.82	Office, Computing & Accounting Machines	3570	0.90%
31. Motor Vehicles, Parts; Trucks & Trailers	323,234,235	1.08%	Motor Vehicles & Parts & Accessories	3711,3714	1.05%
32. Elect. Appliance, Small, Major	331,332	2.26%	Household Appliances	3630	2.76 %
33. Household Radio & TV	334	3.00	Radio & TV Receiving Sets, Ex. Communication	3650	1.68%
34. Communications Equipment	335	0.47%	Communication Equipment & Electronic Communication	3661,3612	0.76%
35. Electrical Industrial Equip.	336	0.62	Elec. Transmission Equp., Elec.Indus. Equipment	3611, 3612	1.38%
36. Cement Manufacturers	341	0.85%	Cement, Hydraulic	3240	0.34%

Table B-1 (cont'd.)

37. Lime, Gypsum, & Concrete	343,345,347,348	0.62%	Concrete, Gypsum & Plastic Products	3270	0.48%
38. Clay Products	351	1.01%	Pottery & Structural Clay Products	3250,3260	0.87%
39. Pharmaceuticals & Medicines	374	8.65%	Drugs	2830	9.09%
40. Paint and Varnish	375	3.32%	Paints & Allied Products	2350	1.54%
41. Soap & Cleaning Compounds	376	10.85%	Soap and Related Products	2841	10.90%
42. Toilet Preparations	377	15.22%	Perfumes, Cosmetics and Toiletries	2842	12.70%
43. Instruments, Orthopedic Surgical & Ophthalmic Goods	3811,3813,3814	1.92%	Scientific Instruments; Medical, Optical, Opthalmic & Photographic Goods	3810,3830,3860	1.99%
44. Watches, Clocks	3812	6.70%	Watches and Clocks	3870	5.13%
45. Jewelry and Silverware	382	0.65%	Jewelry and Silverware	3910	1.70%
46. Sporting Goods, Toys & Games	3931,3932	3.68%	Toys and Sporting Goods	3920	4.07%

Table B-2

Industry Codes

Industry	Industry Code
Motor Vehicles	1
Tires	2
Appliances	3
Farm Equipment	4
Photographic Equipment	5
Power Tools	6
Toys and Sporting Goods	7
Pottery and China	8
Paint	9
Watches and Clocks	10
Mens and Womens Clothing	11
Publishing	12
Writing Instruments	13
Petroleum	14
Cosmetics	15
Toiletries	16
Drugs	17
Soft Drinks	18
Alcoholic Beverages	19
Soaps and Cleaning Products	20
Food Products	21
Airlines	22

Appendix C

SUPPLEMENTAL REGRESSION RESULTS

The following tables report regressions that vary the specifications of those presented in Chapter 11. They are arranged in alphabetical order of the dependent variable. All variables are defined and discussed in Chapter 11, and the methods of construction and sources of primary variables are set forth in Appendix A.

Dependent variable: BIGE

	Constant	VPEUS	CDRC	CDRU	MESU	CNPR	CONO	IMPC	MESC	ADJ R^2/d.f.
b	.6827	-.00001	-.2521	-.0226	-.0099					.0114
beta		-.0769	-.2226	-.0190	-.104					61
t		-.572	-1.757	-.151	-.766					
b	.7485		-.2177	-.0773	-.0158	-.1795	.1689	-.0169	.0010	
beta			-.1925	-.0649	-.1685	-.4198	.3355	-.0257	.0231	.0853
t			-1.566	-.505	01.144	-2.604	1.985	-.1923	.164	56

Dependent variable: CDRC

	Constant	ADI	EFT	CDRU	IMPC	NPW67US	MESU	MESC	WPW67US	WNP67US	ADJ R^2/d.f.
b	.7221	.0058	.0024	.1830							.0443
beta		.0796	.2386	.1650							58
t		.616	1.897	1.270							
b	.7758	.0074	.0027	.1124	.0397						.0348
beta		.1024	.2743	.1016	.0694						54
t		.7642	2.106	.7583	.5329						
b	.2070		.0034	.0810		-1.7502	-.0194	.0152	.6367	.0206	
beta			.3424	.0735		-.2042	-.2097	.3764	.2748	.0805	.0935
t			2.536	.553		-1.464	-1.407	2.337	1.956	.631	52

Dependent Variable CN 468

	Constant	MESC	FSE	CDRC	US468	CONO	CNPR	ADI	EFT	ADJ R^2/d.f.
b	-6.949	2.511	-8.795	28.141	.5294					.7456
beta		.5604	-.1175	.2369	.4263					65
t		7.265	-1.852	3.872	5.545					
b	-2.975		-3.266	28.876	.9172	12.208	-12.731			.5851
beta			-.0436	.2431	.7387	.2127	-.2686			64
t			-.5413	3.087	9.185	2.207	-2.781			
b	-3.537		-1.053	29.265	.9134	14.389	-11.117	-1.020		.5864
beta			-.0141	.2463	.7356	.2507	-.2345	-.1087		63
t			-.1643	3.131	9.154	2.449	-2.314	-1.089		
b	-3.904			29.399	.9094	14.576	-11.061	-1.069		.5927
beta				.2475	.7323	.2540	-.2333	-.1140		64
t				3.181	9.473	2.548	-2.326	-1.214		
b	-3.752		-1.8795	32.022	.9919	11.254	-8.383	-1.140	-.1821	.6164
beta			-.0255	.2789	.7573	.2009	-.1759	-.1242	-.1471	56
t			-.298	3.429	9.412	1.801	-1.573	1.247	-1.658	
b	-4.454			32.222	.9850	11.673	-8.373	-1.226	-.1793	.6225
beta				.2807	.7521	.2085	-.1757	-.1334	-.1449	57
t				3.488	9.651	1.933	-1.583	-1.422	-1.653	

Dependent variable: CUS468

	Constant	REG	LAB2CU	US468	CONO	CNPR	ZE	ZC	SACI	SSI	ADJ R^2/d.f.
b	2.259	.6126	-.0969	-.01211	.2430	-.4905					.3243
beta		.3229	-.0707	-.3116	.1342	-.3156					60
t		2.591	-.653	-2.696	1.000	-2.445					
b	4.244			-.0179			-.3772	-.0138			.2331
beta				-.4453			-.0918	-.2801			66
t				4.187			-.564	-1.717			
b	4.236			-.0179			-.3875	-.0132	-2.820	30.875	.2329
beta				-.4465			-.0943	-.2683	-.1469	.1693	64
t				-4.111			-.566	-1.640	-1.135	1.304	

Dependent variable: EXPC

	Constant	FSE	CONO	CNPR	US468	IMPC	ADJ R^2/d.f.
b	.0778	.1581	.0290	-.0435			.0536
beta		.2852	.0662	-.1176			74
t		2.546	.477	-.855			
b	.00058	.1302	.0209	-.0442	.0023		.1029
beta		.2349	.0477	-.1195	.2484		73
t		2.110	.3536	-.892	2.252		
b	-.0149	.0945	.0526	-.0610	.0022	.1228	.1382
beta		.1705	.1201	-.1649	.2319	.2315	72
t		1.498	.875	-1.238	2.138	1.996	

Dependent variable: FSE

	Constant	US468	CNPR	ZE	PCMCU	MOT	CONO	CN468	LAB167	Q	RPAL	RPAS	EFT	ZC	IMPC	ADJ R^2/c.f.
b	.3787	.0034	.1938	.3899	-.3722	-.0071	-.2106									.0814
beta		.1932	.2955	.2199	-.2123	-.1740	-.2810									63
t		1.653	1.8360	1.071	-1.325	-1.011	-1.773									
b	.5117		.1860	.4772	-.4469	-.0057	-.1926	-.00034								.0423
beta			.2836	.2692	-.2549	-.1382	-.2570	-.0254								63
t			1.706	1.276	-1564	-.7912	-1.565	-.207								
b	-.2119		.2025	.7103	-.3143	-.0052	-.2761		.0393							.0679
beta			.3086	.4007	-.1793	-.1277	-.3685		.2656							63
t			1.896	1.741	-1.064	-.741	-2.072		1.334							
b	.6453	.0034	.1923	.5025	-.3877	-.0065	-.2041			-.3859						.0756
beta		.1957		.2913	-.2212	-.1562	-.2718			-.1089						61
t		1.657		1.265	-1.359	-.888	-1.690			-.827						
b	1.354		.1774		-.2610	-.0137	-.2702			-.9285	-.0288	.2777				.0703
beta			.2828		-.1606	-.3544	-.3866			-.2340	-.0305	.1730				53
t			1.547		.997	-2.46	-2.189			-1.571	-.1760	.921				
b	.4956		.1466			-.0013	-.2298						-.0046			.0575
beta			.2231			-.0326	-.3021						-.2899			68
t			1.447			-.190	-1.994						-1.695			
b	-1.551		.2201	.6644		-.0195	-.2770						-.0015	.0148		.2077
beta			.3356	.3748		-.4773	-.3697						-.0914	.6961		63
t			2.237	1.622		-2.504	-2.382						-.421	3.572		
b	.3697	.0037	.1478			-.0026	-.2323						-.0041			.0843
beta		.1964	.2249			-.0642	-.3055						-.2576			67
t		1.729	1.481			-.378	-2.045						-1.519			
b	.3347	.0027	.1023			-.0016	-.1826						-.0044		.2086	.1231
beta		.1528	.1522			-.0347	-.2357						-.2624		.2251	61
t		1.295	.972			-.205	-1.440						-1.558		1.808	

Dependent variable: IMPC

	Constant	EFT	FSE	CONO	CNPR	ADI	MESU	CDRC	MOT	CN468	REG	ZC	PCMCU	ADJ R^2/d.f.
b	.2159	-.0014	.3584	-.1972	.1564	-.0299								.13264
beta		-.0805	.3423	-.2358	.2193	-.2050								66
t		-.0655	2.792	-1.454	1.473	-1.469								
b	.1860	-.0029	.2777	-.2545	.2401	-.0353	.0284							.1409
beta		-.1729	.2750	-.3273	.3588	-.2677	.2037							59
t		-1.324	2.165	-1.899	2.196	-1.785	1.687							
b	.1282	-.0033	.2548	-.4405	.2231			.0535	.0012	.0013				.1490
beta		-.1803	.2429	-.5579	.3270			.0323	.0275	.0921				49
t		-.917	1.889	3.081	1.819			.249	.152	.691				
b	.2105	.00066	.4158			-.0346			-.0019					.1644
beta		.0369	.3853			-.2381			-.0398					63
t		.219	3.135			-1.933			-.234					
b	.2893	.0008					.0181	.1215	-.0083		-.2267			.02345
beta		.0441					.1260	.0737	-.1804		-.3105			50
t		.217					.818	.508	-.844		-2.151			
b	.2957	.0035	.4087									-.0041	.2528	.1325
beta		.2215	.4264									-.1927	.1458	60
t		1.558	3.422									-1.186	1.028	
b	.1548	-.0031	.3052	-.3023	.2137	-.0209		.1147		-.00003	-.0871			.14866
beta		-.1729	.3031	-.3828	.3196	-.1634		.2177		-.00248	-.1196			52
t		-1.217	2.308	-1.941	1.857	-1.028		.527		-.015	-.796			
b	.6896	.0025	.3618	-.1183	.0205							-.0049		.1202
beta		.1590	.3775	-.1617	.0318							-.2332		59
t		.975	2.847	-.931	.195							-1.60		
b	.2178	.0024	.3693	-.1135	.0077							-.0030	.2666	.1223
beta		.0026	.3853	-.1552	.0119							-.1390	.1537	58
t		.914	2.904	-.894	.071							-.815	1.070	

Dependent variable: IMPC

	Constant	FSE	ZE	WPW67US	WNP67US	NPW67US	EFT	MOT	ZC	RPAS	RPAL	US468	REG	CONO	CNPR	ADJ R^2/d.f.
b	.1852	.2805	.4580	-.4134	-.0268	1.551	.0023									.0596
beta		.2713	.2281	-.1015	-.0533	.0925	.1324									63
t		2.195	1.214	.797	.449	.705	.773									
b	-.5759		1.147				.0069	-.0048	.00256	-.0799	-.2595					-.0702
beta			.5590				.4042	-.1057	.08918	-.0424	-.1959					48
t			1.307				1.355	-.437	.362	-.202	-.821					
b	.4927	.3433	.2979				.0045	.00083	-.0053			.00035	-.1642			.1435
beta		.3582	.1644				.2849	.0191	-.2511			.0207	-.2287			57
t		2.678	.708				1.330	.094	-1.143			.155	-1.668			
b	.5676	.3375	.2419				.0039	.0010	-.0054				-.1639	-.0366	.0082	.1292
beta		.3521	.1335				.2459	.0222	-.2522				-.2282	-.0500	.0127	56
t		2.508	.582				1.010	.105	-1.127				-1.760	-.2646	.077	

Dependent variable: IMPC

	Constant	SACI	EFT	MOT	ZE	ZC	FSE	REG	CONO	CNPR	ADI	SSI	ADJ R^2/d.f.
b	.2757	.8444	.0036	-.0010	.1564	-.0036	.3689	-.1428	.0147	.0500	-.0196	8.173	.1279
beta		.1037	.2298	-.0219	.0863	-.1674	.3850	-.1989	.0201	.0777	-.1551	.1075	53
t		.668	.932	-.100	.333	-.693	2.460	-1.483	.100	.448	-.906	.657	

Dependent variable: MESCU

	Constant	REG	LAB2C	LAB2U	IMPC	LAB2CU	CDRCU	CUS468	LAB167	ADJ R^2/d.f.
b	4.041	2.062	-.0153	.00066	-.8877					.1456
beta		.3559	-.2155	.0096	-.1026					47
t		2.454	-1.823	.055	.723					
b	.3492					-.0436	.2842	1.736		.2729
beta						-.0089	.0292	.5602		48
t						-.071	.245	4.51		
b	.8491				-2.1762	-.0848	.3525	1.6833		.3111
beta					-.2265	-.0172	.0365	.5488		44
t					-1.864	-.138	.302	4.35		
b	3.046						.7913	1.1636	-.2081	.2292
beta							.0836	.4284	-.1986	61
t							.752	3.72	-1.725	
b	3.7229				-.6599		.6923	1.1090	-.2376	.2267
beta					-.0843		.0737	.4119	-.2291	56
t					-.725		.640	3.409	-1.885	

Dependent variable: PCMCU

	Constant	LAB2CU	EFT	US468	CN468	CDRU	CDRC	CNPR	LAB167	CONO	ADJ R^2/d.f.
b	.9572	.0400	.0004	-.0059	.0039	-.0737	-.0392				.0089
beta		.1268	.0378	-.5871	.5358	-.0665	-.0456				41
t		.793	.1817	-2.105	1.832	-.406	-.2168				
b	1.519		-.00057	-.00006	-.00037	-.0693	.0593	.0208	-.0539	.0754	.3015
beta			-.06245	-.0060	-.0497	-.0674	.0647	.0588	-.6988	.1856	50
t			-.4571	-.029	-.238	-.530	.501	.3493	-4.923	1.027	

Dependent variable: R01CU

	Constant	CNPR	US468	MESU	CONO	ZE	CUS468	EFT	ZC	ADJ R^2/d.f.
b	.00725	-.00303	.00005	-.00053	.00434					.1090
beta		-.3477	.2437	-.3163	.4320					55
t		-2.306	1.451	-1.863	2.828					
b	.0401					-.0125	.00022	-.00006	-.00020	.1650
beta						-.49544	.04042	-.32043	-.56062	51
t						-2.111	.293	-1.551	-2.734	

Dependent variable: RPAL

	Constant	LAB2U	EFT	MESC	MESU	CDRU	Q	ADI	CONO	CNPR	LAB2CU	CN468	ADJ R^2/d.f.
b	-.0905	-.0011	-.0056	.0004	-.0194	.6961	.7087	-.0041					.3861
beta		-.1725	-.3266	.0074	-.1175	.3748	.2018	-.0439					34
t		-1.243	-2.464	.0458	-.752	2.714	1.449	-.322					
b	-.1987		-.0031	.0076	-.0275	.6739	.6966		.0171	-.0735			.3675
beta			-.2383	.1402	-.1659	.4351	.2034		.0294	-.1431			45
t			-1.819	1.032	-1.258	3.602	1.730		.197	-.937			
b	-.6884		-.0057			.7649	1.059		-.0377	-.0698	.1532		.4274
beta			-.3516			.4072	.2987		-.0668	-.1329	.3033		38
t			-2.557			3.316	2.514		-.3950	-.793	2.484		
b	-.6916		-.0057			.7646	1.061		-.0386	-.0692	.1529	.00005	.4119
beta			-.3516			.4070	.2991		-.0685	-.1316	.3027	.00455	37
t			-2.523			3.269	2.475		-.3873	-.7616	2.430	.0381	

Dependent variable: RPAS

	Constant	ADI	IMPC	EFT	MESU	CDRU	Q	CNPR	CDRC	CONO	CN468	ADJ R^2/d.f.
b	.4281	-.0139	.0364	-.00017	-.0213	-.2838	.9678					.1656
beta		-.1828	.0622	-.0160	-.2203	-.2417	.4011					52
t		-.1.341	.500	-.1304	-1.629	-1.895	3.096					
b	.3096		.0038	-.0011	-.0213	-.2332	.8863	-.0035	.1875	-.1310		.2103
beta			.0065	-.1137	-.2271	-.2036	.3046	-.0088	.1316	-.2858		48
t			.0473	-.7523	-1.716	-1.564	2.909	-.0494	1.425	-1.495		
b	.4467	-.0172		-.00027	-.0184	-.2822	.9540					.1856
beta		-.2259		-.0254	-.1887	-.2429	.3919					55
t		-1.748		-.2121	-1.469	-1.956	3.135					
b	.4632	-.0123		-.00031	-.01734	-.3002	.9680	-.0165		-.0478		.1697
beta		-.1614		-.02948	-.1775	-.2585	.3976	-.0411		-.1068		53
t		-1.093		-.2214	-1.356	-1.993	3.147	-.2366		-.6434		
b	.2800	-.0059		.00045	-.0343	-.3053	1.039	-.0143		-.0717	.0026	.2262
beta		-.0773		.0425	-.3511	-.2628	.4266	-.0357		-.1602	.3110	52
t		-.523		.321	-2.359	-2.098	3.477	-.2121		-.988	2.208	

Dependent variable: RPR67

	Constant	WNP67US	MESU	US468	CDRU	EFT	NPW67US	WPW67US	Q	CN468	LAB2CU	CDRC	FSE	CONO	CNPR	ADJ R^2/d.f.
b	21.225	-.3826	-2.171	-.0274	9.550	-.0714	221.69	61.23								.2537
beta		-.0199	-.3138	-.0329	.1150	-.0959	.3444	.3515								53
t		-.1732	-2.010	-.2121	.9149	-.8031	2.969	2.787								
b	21.417		-2.013	-.0194	15.886	-.1101			58.106							
beta			-.2909	-.0233	.1913	-.1480			.3347							.1854
t			-1.814	-.1449	1.512	-1.227			2.646							55
b	23.063		-3.276		19.713	.0703			51.460	.1668	.1557	-11.212				
beta			-.5293		.2206	.0805			.3199	.2868	.0061	-.1594				.1620
t			-2.912		1.498	.4359			2.141	1.525	.0447	-.8689				39
b	25.245		-1.966	-.0118	15.857	-.1142			54.884				-3.524			.1766
beta			-.1841	-.0142	.1909	-.1535			.3161				-.0784			54
t			-1.758	-.0894	1.501	-1.263			2.424				-.642			
b	17.506		-3.053		9.887				62.442	.0823						.1944
beta			0.4457		.1257				.3544	.1387						62
t			-3.405		1.108				3.041	1.080						
b	23.717		-2.680		4.290				62.662	.0981				-8.078	-1.572	.2481
beta			-.3912		.0546				.3556	.1653				-.2502	-.0559	60
t			-3.038		.4743				3.137	1.302				-1.810	-.3987	
b	22.242		-2.111		11.099	-.1124			58.056	.1014				-10.602	.1616	.2813
beta			-.3052		.1336	-.1511			.3395	.1700				-.3341	.0057	53
t			-2.271		1.118	-1.183			2.878	1.297				-2.196	.0359	

Dependent variable: RPR67

	Constant	ZC	PCMCU	MOT	EFT	LAB167	WPW67US	WNP67US	NPW67US	B16E	RPAS	RPAZ	ADJ R^2/d.f.
b	88.837	-.3733	40.337										.5385
beta		-.3529	.4916										69
t		-3.702	5.156										
b	174.75	-.8666		.8209	-.1256								.5126
beta		-.8807		.4322	-.1703								66
t		7.735		3.089	1.386								
b	110.68	-0.4773	28.853		.0162								.5276
beta		-.4847	.3549		.0219								66
t		-4.124	3.458		.224								
b	86.165					-5.633	63.477	-.5705	133.74				.8431
beta						-.8063	.3381	-.0233	.1641				76
t						-17.89	7.619	-.523	3.651				
b	27.764									-10.568	39.472	20.620	.7723
beta										-.1271	.5190	.4505	67
t										-2.109	6.688	5.738	

Dependent variable: VPE67US

	Constant	MESU	VRT67US	MESCU	ADJ R^2/d.f.
b	.4577	.0563	19.161	.0014	.0391
beta		.2815	.0637	.0879	66
t		2.351	.532	.725	

Dependent variable; VPW67

	Constant	FSE	VPWUS	MESU	CDRU	EFT	Q	CN468	ADI	CDRC	US468	ADJ r^2/d.f.
b	-4.777	-1.227	.5661	-.3765	.9390	-.0174	6.458	.0604				.7827
beta		-.0672	.7996	-.1313	.0276	-.0565	.0902	.2440				54
t		-1.076	12.327	-1.784	.4494	-.8848	1.365	3.337				
b	3.595	-.1619	.6305	.2006	-1.185				-.5223	.9071	-.0288	.7031
beta		-.0103	.9786	.0910	-.0437				-.2735	.0355	-.1078	60
t		-.1414	11.459	.881	-.546				-2.859	.5167	-1.030	

Dependent variable: VRT67US

	Constant	LAB167	PCMCU	ADJ R^2/d.f.
b	.00011	.00027	.0078	.5851
beta		.3687	.9347	78
t		4.092	10.375	

Dependent variable: ZC

	Constant	WNP67US	ZE	WPW67US	NPW67US	EFT	FSE	US468	MESU	CDRU	SSI	ADJ R^2/d.f.
b	150.97	-1.297	-69.219	15.630	104.824							.5750
beta		-.0586	-.8314	.0876	.1422							64
t		-.7362	-9.081	1.019	1.671							
b	157.06	-1.477	-78.269	18.443	118.398	-.0999						.5763
beta		-.0668	-.9401	.1033	.1606	-.1325						63
t		-.8366	-6.973	1.188	1.855	-1.096						
b	148.70	-0.968	-76.414	21.695	82.755	-.0539	9.033					.6044
beta		-.0438	-.9178	.1215	.1123	-.0715	.1927					62
t		-.563	-7.027	1.440	1.303	-.597	2.342					
b	134.73	-.1886		-32.743	-124.188	.3179	17.008	-.1614	3.493	.9464	-407.63	.3637
beta		-.0092		-.1732	-.1815	.3824	.3378	-.1731	.4637	.0094	-.0977	46
t		-.0819		-1.419	-1.541	3.287	2.721	-1.106	3.067	.0728	-.8526	

Dependent variable: ZE

	Constant	CNPR	MESU	CDRU	US468	LAB2CU	CONO	EFT	SSI	NPW67US	FSE	REG	CN468	ADI	ADJ R^2/d.f.
b	.5741	-.1167	-.0143	.1639	-.0008	.0213	.0499								
beta		-.3808	-.2036	.1624	-.0889	.0766	.1426								.1166
t		-2.191	-1.162	1.098	.5060	.5253	.8312								44
b	.6928	.0399	-.0015	.1717	-.0009	.0078	-.1054	-.0071							
beta		.1304	-.0219	.1702	-.0983	.0279	-.3140	-0.7369							.4913
t		.8216	-.1612	1.516	-.7376	.2510	2.061	-5.781							43
b	.5720		-.0147	.1736				-.0053	6.090	2.001					
beta			-.1853	.1818				-.6226	.1593	.2693					.5761
t			-2.196	2.131				-7.199	1.860	3.135					56
b	.6272		-.0087	.1418	-.00116			-.0053	6.109	2.064					
beta			-.1086	.1484	-.1212			-.6270	.1598	.2774					.5773
t			-.983	1.637	-1.097			-7.253	1.869	3.224					55
b	.6630		-.0085	.1297	-.00096			-.0053	5.245	2.325	-.0804				
beta			-.1062	.1358	-.1011			-.6304	.1372	.3128	-.1549				.5937
t			-.982	1.523	-.912			-7.436	1.618	3.609	1.793				54
b	.4492		-.0157	.0804					11.624	2.805		.0520			
beta			-.1971	.0842					.3040	.3774		.1469			.2042
t			-1.634	.718					2.614	3.23		1.198			56
b	.6031	.0010	-.0141	.1481			-.0646	-.0054	3.776	1.825			.0006		
beta		.0031	-.1764	.1550			-.1768	-.6399	.0987	.2455			.0870		.5834
t		.0255	-1.787	1.737			-1.458	-6.530	1.090	2.850			.8706		53
b	.8555		.0155		-.00213		-.0584	-.0063		2.011				-.0161	
beta			.2014		-.2103		-.1394	-.7134		.2341				-.2246	.6550
t			2.010		-2.138		-1.674	-9.70		3.202				-2.675	61